MISSOURI BOTANICAL GARDEN

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Number 1

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byi), Purple-leaf Winter-Creeper *(Euonymous fortunei reticulatus)* and Liriopes of many kinds. The Liriopes or Lily-Turfs are represented by eight species or varieties (the first big trial of these in Northern gardens), each demonstrating a remarkable type of cover for densely-shaded locations. *Liriope muscariodes*, not as widely known as the other species, is by far the best for St. Louis gardens. In early May the pale lavender flowering spikes of the native Ozark Wild Hyacinth, *Camassia scilloides*, will super-carpet the area. While the life on the Mausoleum floor begins early and changes rapidly so does that of the trees above. The small, yellow flowers of the Sassafras *(Sassafras albidum)* appearing before the leaves, are among the earliest of flowers. The flowering Dogwood *(Cornus florida)* and many early azaleas are some of the more showy shrubs adding a temporary brightness to what one might suppose a sombre atmosphere.

—E.L.E.

Wood Hyacinths in the Mausoleum grove.

INSIDE A MISSOURI BALD CYPRESS SWAMP

JULIAN A. STEYERMARK

THE extraordinary beauty and majestic stature of Bald Cypress *(Taxodium distichum)* can be seen to great advantage in old trees at the Missouri Botanical Garden and Tower Grove Park in St. Louis. The natural distribution of the species in Missouri is confined to the southeastern lowland section of the state, reaching its northernmost limits there in Cape Girardeau, Bollinger, Wayne, and Ripley counties.

Natural stands of Bald Cypress were formerly much more abundant. Today, after decades of heavy lumbering over a large area, these beautiful trees have become much less frequent, and are now found only in scattered patches. Clearing of the land for cotton, soybean, and watermelon has left millions of acres of bare soil where once stood tall forests of these trees. Although some Bald Cypress may be found at the Big Tree State Park in Mississippi County, an effort should be made to preserve for posterity some remaining stands of this species before it becomes destroyed and exterminated from the relatively few remaining sites in the "boot-heel" section.

Many people, undoubtedly, have seen Bald Cypress in southeastern Missouri while driving along some of the highways. Good examples of these trees in their natural habitat are familiar to those traveling south of Advance on highway 25, or when crossing the St. Francis River on either highway 25 northwest of Cardwell in Dunklin County or highway 53 at the border of Dunklin and Butler counties. There are still many sections of the St. Francis River bottoms as well as other areas away from the more frequented highways which display magnificent stands of Bald Cypress, and some individual trees have been left standing after heavy lumbering or clearing of areas for agricultural purposes.

Inasmuch as most people are not familiar with the interior of an unspoiled cypress swamp, it may be of some value here to describe such an area. During the spring and early summer months the undrained virgin Bald Cypress swamps (see photo) are usually so full of water that it is virtually impossible, unless one has a small boat, to get around inside. Also, at that time of year the hordes of mosquitoes are so thick and annoying that one does not usually wish to remain for any length of time in such a place. However, if one can brave the mosquitoes for a while, many very interesting aquatic plants may be seen there. Of plants floating on the water, probably the most peculiar is the Water Violet *(Hottonia inflata)* with hollow, pale-green, leafless flowering stems rising above the water-surface. Bright masses of yellow flowers covering the water are those of Yellow Water Crowfoot *(Ranunculus flabellaris)* with submerged finely-cut leaves. Other submerged lace-like foliage in the swampy waters belongs to Lake Cress *(Armoracia aquatica)* and Mermaid Weed *(Proserpinaca palustris)*. If the surface of the water has a thin pale-green covering it is due to the floating col-

families of plants, the Leguminosae, particularly the sub-family known in technical terms by the impressive, mouth-filling phrase of Papilionaceous Leguminosae — Pa-pil-i-on-a-ce-ous Le-gu-min-o-sae.

Scientific terms are frequently so long and so different from everyday speech as to frighten away the ordinary amateur. Occasionally, however, a term turns up which is so perfectly terrible that it is as much fun to learn as a nursery rhyme. If you want to learn something useful and at the same time acquire an air of erudition, spend a few hours with the Sweet Peas and their interesting relatives and you will be able to talk with real understanding about *Pa-pil-i-on-a-ce-ous Le-gu-min-o-sae* such as Wisteria, Clover and Black Locust.

Begin with the Sweet Pea blossom with its strange butterfly shape. Use a fading flower, if possible, whose petals are getting ready to fall. You can gently pull out all five of these curiously formed objects. They are of three sorts. One stands up with a crease down its middle where it was folded, tentlike, over the whole blossom when it was in the bud stage. This petal is called the STANDARD (an old word for a flag). On either side (mirror images of each other like two cupped hands) are the so-called WINGS. These petals each have two curious flanges at the base, one hitches the petal to the base of the flower, the other engages like a patent catch with other parts of the blossom. The two other petals are more or less stuck together into a little boat-shaped object at the base of the bloom and they are aptly termed the KEEL. (See illustration page 42,)

The Sweet Pea, in other words, in spite of its air of fantasy, is not so different from the ordinary Buttercup or Wild Rose. It too is made up of five petals but unlike all buttercups and all roses one of these is specialized into a standard, two are wings with curious flanges at the base, and two (more or less adhering to each other), form the keel.

After we have removed the petals from a Sweet Pea flower, the remaining portion is not very easy to see because it is rather small; but anyone with good eyesight can make out the fact that most of the stamens are united over a good part of their length into a sort of little white shirt and one of the stamens is completely separate. After you have familiarized yourself with these facts it is better to turn to the pea pods from the grocery store. (see illustration page 42.) They came from a very similar kind of blossom, a little smaller, to be sure, than the average Sweet Pea but with a standard, two wing and two keel petals, and with nine stamens webbed together and one separate (you'll find them all dried up but still hanging together down next to the calyx). When the seed-bearing portion of the flower begins to develop it grows to many times its original size and becomes big enough to analyze with the naked eye. The PISTIL in the center of the flower is shown to be made up of two parts which open up when the seed is ripe, displaying one row of seeds which hang

from the two inner edges of the joined CARPELS. Such a seed pod is known technically as a LEGUME. The LEGUMINOSAE, therefore, are those plants whose seeds are borne in LEGUMES.

Most of the Leguminosae which we see in the temperate zone have flowers like the Sweet Pea as well as pods like pea pods. With their bright colors and graceful petals they have reminded many people of butterflies; since the classical word for butterfly is PAPILIO, what could be more natural than to refer to such legume-bearing butterfly-flowered plants as Papilionaceous Leguminosae?

If you will look carefully at a REDBUD flower you will find that though the blooms remind you of a tiny Sweet Pea in a general sort of way, they do not fold up into a bud quite like the Sweet Pea bud. The keel petals are only vaguely like a keel, the wing petals do not have complicated flanges; they do, indeed, belong to the Non-papilionaceous Leguminosae, and are closely related to many of the dazzling flowering trees of the tropics, many of which have strange leaves something like the curious leaf of the Redbud. The Redbud bears, among other distinctions, the honor of being Missouri's commonest non-papilionaceous legume!

The Leguminosae not only have distinctive flowers, they are distinctive in other ways. If you learn to recognize them by the flowers, you will understand many other things as well. Their leaves and leaflets have special little valves, or PULVINI, at the base which permit them to move about more rapidly than do the leaves of most other plants. The Sensitive Plant or Mimosa is a Legume related to the Acacias and other tropical non-papilionaceous legumes. It is the pulvini at the bases of mimosa leaves and leaflets which make them close up when the plant is touched. It is the pulvini on the common white clover which close up the clover leaf at night so that the two side leaflets are pressed close together and the middle one folds down over them like a tent. If you want to see a most peculiar sight, turn a flash light (or the headlights of your car) on a Black Locust tree at night and see the way the leaves are all folded up.

Another characteristic of this unusual plant family is its ability to go into partnership with soil microoraganisms and get nitrogen out of the air and into useful proteins. All our best meat substitutes come from the Leguminosae: beans, peas, lentils, pulses, chick peas, Korean lespedeza, soy beans. The Leguminosae play an important role in our diet and in that of our farm animals; we are just beginning to understand how important they are as game foods; we are learning to use them effectively in building up our soils. All the clovers, all the alfalfas, all the vetches are Pa-pil-i-o-na-cae-ous Le-gu-min-o-sae.

SPRING-FLOWERING LEGUMES OF FIELD AND GARDEN

Cladrastis (Yellow Wood)
Laburnum (Golden Chain Tree)
Lathyrus odoratus (Sweet Pea)
Lupinus (Lupine)
Medicago (Alfalfa)
Melilotus (Sweet Clover)
Robinia hispida (Rose Acacia)
Thermopsis (Banner Plant)
Trifolium (Clover)
Wisteria (Wisteria)

The 1956 systematics symposium participants at the Museum where the fifth annual symposium will be held October 25.
(Photo by Dr. Frederick Meyer)

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COVER: *Camellia japonica* "Mathotiana"—many such perfect blooms as this, in white, red, delicate pink and variegated can be seen in the Linnaean House, where every year in Mid-winter the Camellias present one of the finest shows at the Garden. Photo by Paul A. Kohl.

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THE MAUSOLEUM GROUNDS COME TO LIFE

THE Snowdrop or Galanthus (Greek for milk flower), considered a harbinger of Spring, has been flowering in the Mausoleum enclosure at the Garden since the last of January. Snowdrops are Spring-flowering bulbs (there are a few autumnal kinds rarely seen in American gardens) belonging to the Amaryllis Family. The genus has twenty-two or more species and named varieties, all native to the Old World. Of the species represented in mass here, the first-blooming are the tetraploid varieties of *Galanthus elwesii*. The later ones are the diploid *G. nivalis*. The Garden has numerous other varieties and species that, so far as we know, make up the most complete collection in America. The normal flowering period for these early-blooming bulbs is from late January to early March when they are frequently seen nodding above the snow. They thrive best in dry leafmold and seem happiest under a cover of Ivy. New introductions and transplantings of Galanthus, unlike those of most other plants, should be made while the bulbs are in full flower, for then the bulbs are dormant.

These hardy little flowers herald the arrival of longer days and of numerous other perennials, among the first being Aconitum or Monkshood, a member of the Buttercup family. Following closely and blooming with these earliest plants are Crocus, Muscari the Grape Hyacinth, Daffodils, Jonquils and Scillas, the English Bluebells or Wood Hyacinths. This last group is made up of *Scilla nutans*, *Scilla campanulata* and their hybrids. This is no doubt the finest collection in the New World, with color varieties of dark, light, and pale blue, deep pink, gray-pink as well as white and cream—an outstanding collection with many self-sown hybrids which occurred right there! Scillas also love the ivy cover.

The many tall, ivied oaks, the sassafras and other trees and shrubs in and surrounding the fenced enclosure where Mr. Shaw is buried, preserve a quiet, shaded, but living mausoleum for the Garden's founder (indeed, like no other place in the United States, it resembles the private burial grounds of English gentlemen).

Since lawn grasses will not grow satisfactorily in the shaded area, many different kinds of evergreen ground-covers have been planted in sizeable groupings forming a mosaic or patchwork pattern. The patches consist of Rumanian and Bulgarian Ivy (the first large plantings made in the United States), Myrtle or Periwinkle *(Vinca Minor)*, Pachystima *(Pachystima Can-*

onies of Duckweed (*Lemna* spp.), Watermeal (*Wolffia* spp.), and Water-flaxseed (*Spirodela polyrhiza*). Patches of green in the water may be due to the slender stems and submerged needle-like leaves (beneath the floating broader ones) of the Water Starwort (*Callitriche heterophylla*). Swamp Dock (*Rumex verticillatus*) is prominent in the water with its tall green stems of whorled greenish flowers raised above a cluster of smooth, flat, mostly upright leaf-blades.

With the approach of autumn and the gradual drying-up of the swamp, it becomes more hospitable with a less bothersome mosquito population. The ground is then dried sufficiently to permit foot navigation, and a more detailed investigation can be made of the vegetation. Upon entering such a swamp in the late summer, one is immediately impressed by two things: 1) the great size and stature of the trees, and 2) the swollen or buttressed bases (see photos) of the trunks of the Bald Cypress and Swamp Tupelo (*Nyssa aquatica*). One is also struck

Bald Cypress trees. Note "knee" projecting from water. Photo by author.

Buttressed trunks of Swamp Tupelo. Photo by author.

by the great thickness and height of the vines. Here are high-climbing woody vines of Trumpet Creeper *(Campsis radicans)* and its relative, the Cross-vine *(Bignonia capreolata)*; Grape *(Vitis cinerea, V. rotundifolia,* and *V. palmata)*; Poison Ivy *(Rhus radicans)*; Ladies'-eardrops *(Brunnichia cirrhosa)*; Wisteria *(Wisteria macrostachya)*; Raccoon Grape *(Ampelopsis cordata)*; Pepper-vine *(Ampelopsis arborea)*; Virginia Creeper *(Parthenocissus quinquefolia)*; and Supple-Jack or Rattan Vine *(Berchemia scandens)*. Usually the trees are so tall that one sees only their bare trunks extending for some distance up to the first leafy limb, which often makes it difficult to identify them. With patience, however, one learns to distinguish a large variety of trees. There are a number of large-sized oaks, including Over-cup *(Quercus lyrata)*, Mossy-cup *(Q. macrocarpa)*, Swamp-White *(Q. bicolor)*, Basket *(Q. Michauxii)*, Pin *(Q. palustris)*, Willow *(Q. Phellos)*, and Water *(Q. nigra)*. Sycamore is common, as are also Pumpkin Ash *(Fraxinus tomentosa)*, Red Maple *(Acer rubrum* var. *Drummondii)*, Water Locust *(Gleditsia aquatica)*, Hackberry *(Celtis laevigata)*, Water Hickory *(Carya aquatica)*, and Pecan *(Carya illinoensis)*.

Among the smaller trees, Water Elm *(Planera aquatica)* with its flaky bark, and Persimmon *(Diospyros virginiana)* with bark checked like that of an alligator skin may be recognized.

As one walks around in such a swamp, one sees a number of interesting shrubs, many of them to be found only in this section of the state. Among these should be mentioned Water Willow *(Itea virginica)*, Storax *(Styrax americana)*, Stiff Dogwood *(Cornus foemina)*, Swamp Rose *(Rosa palustris)*, Swamp Privet *(Forestiera acuminata)*, and Button Bush *(Cephalanthus occidentalis* var. *pubescens)*, an especially common shrub.

The great height of the trees combined with the abundance of vines produces a dense shade and one soon becomes enveloped in this relatively dark interior where a sombre silence prevails. Where in the rainy periods of spring and early summer lay endless expanses of dark silent water of uncertain depth, now in late summer and autumn the ground has become covered with herbaceous plants whose period of growth started when the waters receded. Myriads of ground plants are now evident. Bugle Weed *(Lycopus rubellus* var. *arkansanus)* with pairs of narrow, slightly toothed dark green leaves and little clusters of white flowers pegged along the stem; Marsh St. John's-wort *(Hypericum tubulosum* var. *Walteri)* with pairs of thin gray-green leaves; colonies of the fragrant-leaved Lizard's-tail *(Saururus cernuus)*, the closest relative in Missouri to the tropical Black Pepper family; Blue Mist flower *(Eupatorium coelestinum)* with clusters of blue-lavender Ageratum-like flowers; sprawling mats of the climbing white-flowered composite *(Mikania scandens)*; and various grasses *(Paspalum fluitans, Cinna arundinacea,* and species of Panicum*)*, and sedges *(Cyperus strigosus, Rhynchospora corniculata,* and species of Scirpus*)*—are all commonly encountered. In addition, there are usu-

ally present other kinds of herbaceous plants, such as False Loosestrife *(Ludwigia glandulosa)*, False Pimpernel *(Lindernia dubia)*, Water-willow *(Dianthera ovata)*, Loosestrife *(Lysimachia radicans)*, Buttonweed *(Dioda virginiana)*, Eryngo *(Eryngium prostratum)*, and Beggar-ticks *(Bidens discoidea)*. The latter often seeds itself on floating logs, living or dead tree trunks, or old stumps, and may, thus, appear several feet above the general ground level. Various kinds of mosses and liverworts clothe the bases of living tree trunks, while others are found on floating logs and decayed stumps. A beautiful, lacy, dark green liverwort *(Porella* spp.*)*, is commonly found attached to and encircling the base of trees, usually above the high water level of flood stage.

The "knees" of the Bald Cypress are conspicuous in the swamps. They vary in prominence from small, short stubs to elongated, stalagmite-like pale brown growths protruding above the ground-surface. They are thought to help facilitate the conduction of oxygen to the tree when the roots are submerged for extensive periods of time.

There are many other herbaceous plants in addition to those mentioned here that may be found within the interior of a Bald Cypress swamp, but the brief statements made in the preceding paragraphs will give us some idea of the principal plants to be encountered.

A SATURDAY AFTERNOON WITH EPIDENDRUMS

One of the bright little orchids in the Garden's collection which has always interested me is *Epidendrum Obrienianum* (a hybrid between *E. evectum* and *E. radicans*). The brilliant orange-red flowers are seldom as large as your thumb nail but they are borne in little bunches at the ends of long bamboo-like wands and they flower almost continuously. In the Los Angeles area they are grown along the patio fence and many beginners with orchids have a soft spot for them because they give so much bloom for so little trouble. If the whole flower cluster is cut without too long a stem, they last amazingly long as cut flowers; I have frequently had three or four bunches of them in a little brass vase on the mantlepiece flowering away for several weeks or a month.

In California these ever-ready Epidendrums are beginning to interest some amateurs and a few professionals. At the first World Orchid Congress (held at the Garden in October of 1954) there was a nice display of selected varieties in red, orange, pink, yellow and intermediate shades. They should ultimately serve as the basis for a set of easy-to-grow, interesting orchids for the small greenhouse or even for the beginner's sun porch.

During my first week in Medellin, Colombia, I was driven over the main ridge of the Central Cordillera which forms a thousand-foot-high wall along the west edge of the mountain valley in which the city is located. At several places along the road I noticed clumps of bright little Epidendrums, closely related to *E. Obrienianum*. A

week later a car was again available on Saturday afternoon (it never pays to study corn *ALL* the time) and so I was driven up the winding black-top road which connects Medellin with the old city of Antiochia.

As one rises above the city there are wider and wider views across the valley with the city now filling the flat central floor, its suburbs spreading up towards the sides and the ends. The road is lined with modern week-end estates of the well-to-do, covered with flowering vines and surrounded by orchards and gardens. The most ambitious of these estates have a five- or six-room house for the *major domo* in addition to the owner's home, and scattered here and there one or two tiny homes for the workmen. It was in this suburban zone that I came upon the first of the three kinds of Epidendrums which grow along the road. They were growing like weeds in the roadside banks in gravelly soil in full sunshine. This first kind had orange-red flowers, some with tiny dots of deep red, on plants which were, for the most part, only two or three feet high at the most (though this figure doesn't mean very much because the roadsides are so frequently cut or grazed or tramped over). No wonder these orchids will put up with such a variety of conditions! They have been bred as weeds; they really are weeds, or at least common roadside plants in the places where they grow.

Five miles above, at the pass over the Cordillera, we came upon another related species. Here the city and its suburbs had been left behind. The bare, steep, pastured peaks rose on either side, only a few of them forested any more, except along the water-courses. Here, in remnants of the original woods intermixed with bright red-purple Melastomes and Angels Trumpets (Datura) of purest white, were some very similar Epidendrums, bright rose-pink in color, smaller flowers, in much larger bunches on much larger plants with wider leaves. Within a mile or two they began to show hybridization with a yellow-flowered species which grows at lower elevations in drier sites (though all of these were growing on the highly disturbed vegetation that had flooded in when the big earth cuts were made a decade or so ago to carry this road across the Andes). The biggest of these hybrid swarms was something to see! Fist-size bunches of bright little flowers hung out away from the slopes on narrow reed-like stems no thicker than a telephone wire. Each plant was of a different shade. There were deep pinks and light pinks and very bright pale pinks. There were deep yellows and light yellows and a dull pinkish-yellow. There were deep creams and pale creams and a lovely pure white, all of them with delicate little fringes on the lip and varying amazingly in the technical details of their spottings and rumplings when looked at through the hand lens. I made quite a collection of them and carried them back to my hotel where they are now effectively pickled for further study in small bottles of the native bay rum (it was Sunday and the laboratory was closed). If all goes well they will be useful material for my Washington University classes next February and March

and then we shall perhaps understand just a little better these sturdy and brilliant little plants.

—Edgar Anderson

(The foregoing article was received from Dr. Edgar Anderson in the fall of 1957 while he was in Colombia making a study of the varieties of corn in Bolivia, Chile, and other parts of South America.)

HORTICULTURE COURSES OFFERED BY THE GARDEN

COURSE III SPRING HORTICULTURE

THE object of this course is to assist beginning gardeners to learn how to propagate plants from seed. Special emphasis is placed on annuals and perennials. Each session will include a lecture period and a practice period. The lecturers will discuss the factors affecting plant growth and the practical means for their control, such as optimum supply of heat, light, moisture, air, fertilizer, lime and mulches; methods of pest and disease control will also be discussed.

Each student will receive seeds and four metal flats and sterilized soil. There will be enough space to grow about 300 to 350 seedlings which, with the flats, may be taken home. Seeds of plants, particularly desired by any student, should be brought to the first session.

The course will be given in the Experimental Greenhouse, Missouri Botanical Garden (enter Cleveland Avenue Gate, 2221 Tower Grove Avenue).

It will be offered in four duplicate sections of five periods each:

Section I meets 9:00 A. M. to 12:00 Noon, Fridays, March 21, 28, April 11, 18, 25.

Section II meets 1:00 to 4:00 P. M., Mondays, March 24, April 7, 14, 21, 28.

Section III meets 1:00 to 4:00 P.M., Wednesday, March 26, April 9, 16, 23, 30.

Section IV meets 7:00 to 10:00 P. M., Tuesdays, March 25, April 8, 15, 22, 29.

Register between February 14 and March 14, 1958. Fee: $15.00.

COURSE IV GROWING ORCHIDS IN THE HOME

The course consists of one full day of instruction and workshop with the following schedule:

10:00 A. M. Topics discussed will include kinds of orchids suitable for home culture (orchids that like St. Louis), the factors influencing their growth and development—light, temperature, etc., and how these conditions can be created in the average home using Wardian case, evaporative dish, artificial light, etc. There will be a demonstration of potting methods and, if time permits, a question and answer period.

12:00 Noon. Lunch. Coffee and soda supplied by the Garden.

1:00 P. M. Examples of growing orchids in unusual containers in the home—baskets, slabs, poles, etc., with demonstration of potting and care.

2:00 P. M. Inspection of Greenhouses.

3:00 P. M. Members of the Orchid Department staff will give individual instructions in potting. Students may take potted plant home.

The course is offered twice—Section I, Saturday, April 19, 1958, at the Orchid Range of the Missouri Botanical Garden Arboretum, Gray Summit, Missouri; and Section II, Saturday, April 26, 1958, at the Missouri Botanical Garden, Flora and Tower Grove Avenues (The Main Gate entrance), St. Louis 10, Missouri.

Register at 2315 Tower Grove, St. Louis 10, Missouri, fee $10.00.

COURSE IN WILDFLOWER IDENTIFICATION FOR FRIENDS OF THE GARDEN

This year the Garden will offer for the first time a series of five workshop sessions on Botany for the busy citizen, open to Friends of the Garden only, free of charge. The workshop will be taught by Dr. Edgar Anderson and his assistants and will be similar to the high school course for amateurs which he taught so long and so successfully at Washington University. It is designed for the person of no specialized botanical training who after his school years discovers he wants to know more about plants. It is essentially a course in how to find your way to the information you need, how to learn about plants from plants, how to learn about Ozark wild flowers as painlessly and effectively as possible, how to learn to know and understand the plants in your garden.

The sessions will meet on Thursdays, April 10, 17, 24 and May 1 and 8, from 8:00 P. M. to 9:00 P. M. Friends of the Garden members who wish to attend must register before April 8, since the class will be limited in size.

BOOK REVIEW

How to Identify Plants. By H. D. Harrington. Illustrated by L. W. Durrell. 203 pp. Sage Books, Denver, 1957. Price $3.00.

TRYING to identify a plant with even the best of the manuals is a difficult task for someone who is not familiar with the terminology and methods used in plant identification. This book is written to teach people how to name plants. It covers briefly most of the steps involved, from collecting and preparing specimens, through the selection and use of the proper flora or manual. There is a simple, illustrated glossary of the terms commonly used in manuals and floras along with some maps helpful in selecting the text to be used. The book is simple, the margins and spacings are ample, and there is considerable repetition.

This is a book of value to beginners who have no one to guide them past the many pitfalls found in the common plant manuals.

—Hugh Cutler

COLD FRAME OR MINIATURE GREENHOUSE FOR SMALL GARDENS

HERE is an easy to make cold frame suitable (1) for starting plants in the Spring before danger of frost is past; (2) for receiving plants from a hot bed or greenhouse, holding them as an intermediate station until they can be planted in position in the garden; (3) for a general storage place for hardy or semi-hardy plants from the garden and (4) for a propagating bed in Spring or Summer for seed and/or cuttings.

For the first three uses select a location affording the maximum amount of winter sun, preferably facing south and protected from the wind. Dig a trench 3 ft. × 6 ft. and 4 to 6 inches deep. The bottom can be filled with loosened earth, sawdust, leafmold or other material for imbedding clumps, pots or flats of plants. The soil removed from the trench can be used to bank against the outside of the frame when it is in place.

MATERIALS NEEDED:

Three boards 1 in. × 12 in. × 6 ft. to be used for the sides; one piece is cut diagonally for the two sloping sides. (Note: actual measurements of dressed lumber run approximately one-fourth inch less than size specified.)

Three boards 1 in. × 12 in. × 3 ft. to be used for the ends.

Seven pieces 1 in. × 2 in. × 6 ft. to be used for the cover frame, the crosspiece, and the cleats (indicated in drawing by broken lines).

Four pieces 1 in. × 1 in. × 6 ft. and four boards ¼ in. × ½ in. × 6 ft. cut to 3-foot lengths to be used in fastening the plastic to cover frame. (The 1 in. × 1 in. stripping should be placed carefully on underside of cover frame to assure snug fit of cover to box.)

Eight 2 in. × 2 in. × ⅝ in. corner irons for bracing cover frame. Three-fourths pound of #7 screws for fastening corner irons in frame.

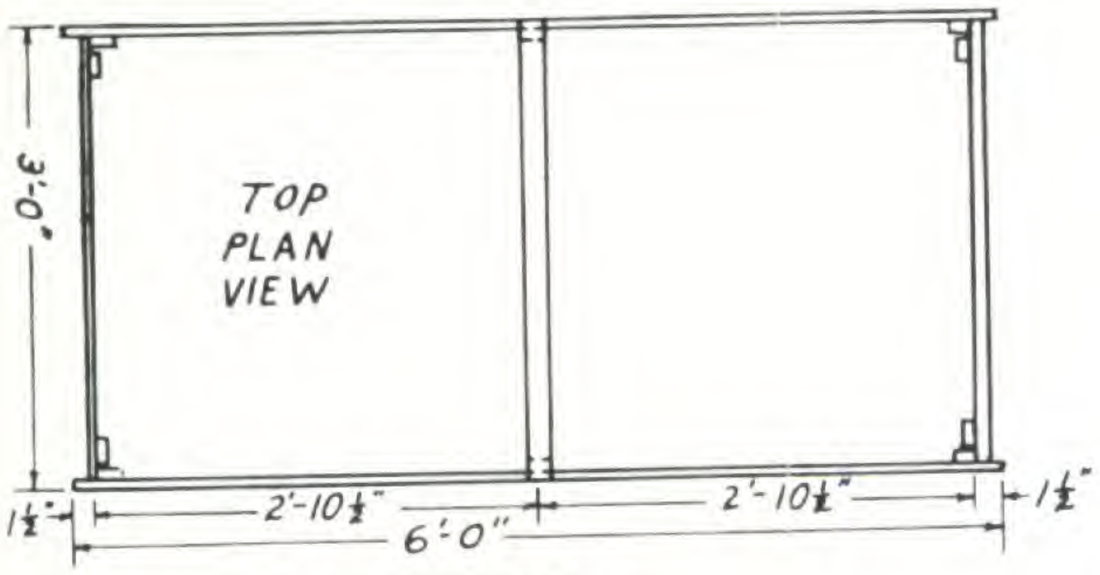
One-fourth pound of #6 aluminum nails for fastening cleats to sides and strips to lower side of cover.

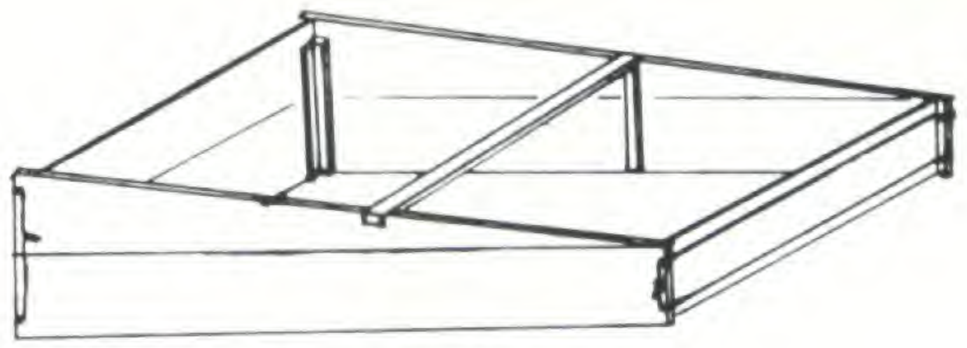
Small brads for strips on upper side of cover. Twenty-five feet of #12 gauge galvanized wire for securing framework of box.

Four pieces of polyflex plastic sheet 3 ft. × 3 ft. for double layers in cover.

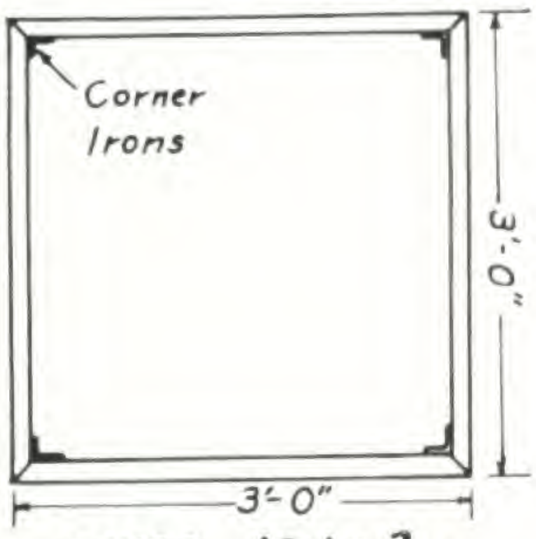
The use of Western Red Cedar, California Redwood or Southern Cypress is preferable and will give longer service than other kinds of lumber where wood is in direct contact with soil. If the cold frame is to be painted it should either be treated first with a fungicide or be painted with a fungicidal greenhouse paint.

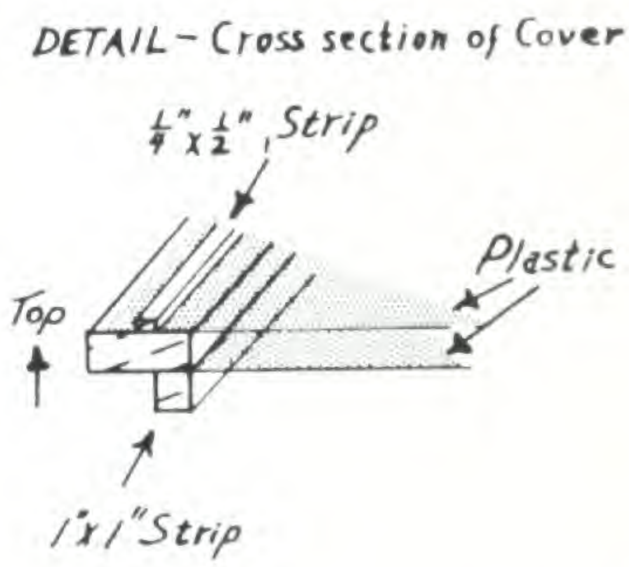
Proceed by cutting all materials to size and assemble as indicated in drawings. Cleats and all joints should fit snugly to prevent drafts or loss of heat. Saw narrow, 1-inch-deep slots in the ends of the sidepieces and, dividing the wire, run it through the slots binding the two sides together across each end of the frame on the outside (see sketch). The top sashes should

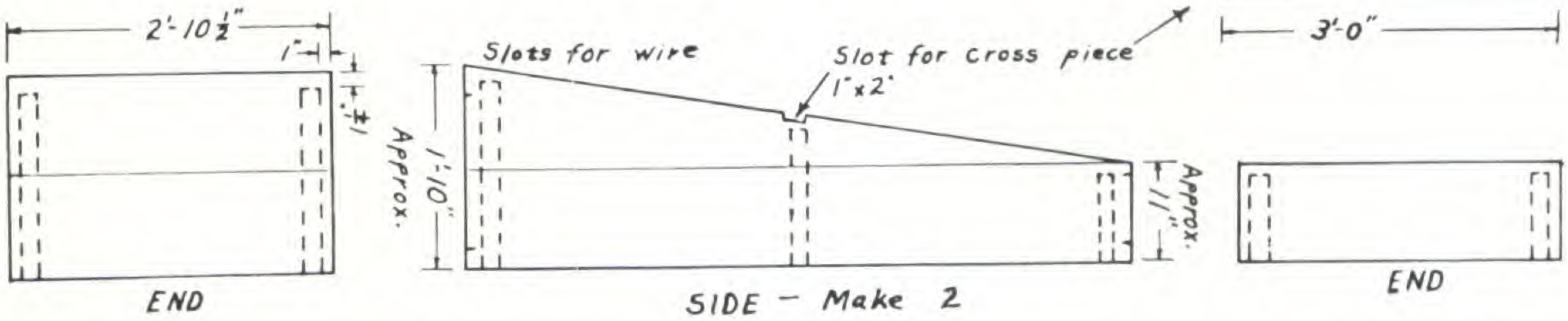




Sketch of cold frame







Plan for making unheated portable cold frame which can be disassembled and stored when not in use.

be made to fit snugly into place. They are constructed with two pieces of plastic with a dead-air-space between to provide insulation, preventing loss of heat and the penetration of cold. The design presents a sloping top to give maximum sun exposure and adequate run-off for water. The covers are fastened to the sides with screen-door hooks to prevent their being blown off by wind or moved by animals and at the same time to allow for easy opening.

Plants placed in the cold frame should be soaked well at the start, then watered from time to time when necessary to prevent excessive drying.

This frame when equipped with an electric heating cable and a thermostat can readily serve as a minature greenhouse or hot bed.

—E. L. E.

BIRD NOTE

The Garden is a haven for many wild birds; among the Winter visitors is a small flock of waxwings (probably Cedar Waxwings). The Spring migrations are already bringing many unusual songbirds that add to the pleasures of the keen observer walking in the Garden.

XANTHOCERAS, THE CHINESE BUCKEYE

A Good Shrub for St. Louis Gardens

Should you visit the Garden in the Spring, you may find blooming there a shrub which, while not new, is very interesting and worthy of special attention from garden lovers. It can be located at the turn of the path east of the old Shaw residence and south of the Museum. The plant referred to is *Xanthoceras sorbifolius*, a native of North China. (Xanthoc-eras: Greek for *yellow* and *horn*, referring to the horn-like processes of the floral disk; and sorbifolius: Latin for *leaves like Sorbus*, the Mountain Ash.) A member of Sapindaceae or Soapberry family, this deciduous shrub or small tree, known also as Yellow Horn or the Chinese Buckeye, is related to the Golden Rain Tree *(Koelreuteria paniculata)* and to the Soapberry tree *(Sapindus Drummondii)*, both of which may be found in the Garden. It is a handsome shrub, though of somewhat loose growth habit, attaining a height of 15 feet, with alternate odd-pinnate glossy leaves from 6 to 12 inches long, the many leaflets dark green above and paler beneath. The flowers, about an inch in diameter, are white with a yellow changing to red spot at the base of each petal. They appear in upright racemes 6 to 10 inches long, resembling those of Catalpa or Chestnut. Xanthoceras plants have been growing in the St. Louis area for more than thirty years and are well adapted to the hot dry summers as well as the variable winters. They can be used in a border or as individual specimens.

Propagation from seed is rare since the plant only sets a good crop of fruit once in four or five years and then only a few of the buckeye-like seeds are viable. The squirrels find the seeds delectable which adds a further complication. The plant does not root readily, if at all, from softwood or hardwood cuttings. Root cuttings seem to be the best and most satisfactory means of propagation as the plant spreads naturally by suckering. If three- or four-inch pieces of the heavier roots are placed in a propagating frame in early spring, within four weeks new shoots will appear and shortly thereafter the cuttings should be potted and placed in a warm house until later in spring, when they may be planted in a cold-frame or the nursery, or the individual root cuttings may be placed directly in a six- or eight-inch pot and left there for an entire year. Since Xanthoceras does not stand transplanting very well, a single cutting should be planted in a pot. Continued interest in this shrub will doubtless bring about more efficient means of propagation and perhaps further improvements horticulturally.

—E.L.E.

NOTES

THE Garden and the Henry Shaw School of Botany welcome a new Taxonomist, Dr. Robert L. Dressler, to their staffs. His is the return of a native, so to speak, since Dr. Dressler went from Branson, in the heart of the Missouri Ozarks, to the University of Southern California where he obtained a B.A. degree in Botany. He then did graduate work under Dr. Reed C. Rollins at Harvard University where he completed studies on the genus Pedilanthus for a thesis and received a Ph.D. degree in Botany in 1957. He traveled extensively this past summer in Mexico, mainly in the state of Tamaulipas, making studies and collections of various plants, although he was primarily interested in study material of Poinsettias, other Euphorbias and the various Orchids of the region. Dr. Dressler will conduct classes relating to Plant Taxonomy for the Henry Shaw School of Botany and will also be responsible for taxonomic problems concerning the vast collection of plants that makes up the living display of the plant world which is Shaw's Garden. In addition, he will edit the ANNALS OF THE MISSOURI BOTANICAL GARDEN.

A former graduate student at the Garden, Mr. E. L. Evinger, who received his M.S. degree in the Henry Shaw School of Botany in 1928, has returned as Horticulturist in charge of the introduction and propagation of trees, shrubs and other outdoor plants at the Garden.

Mr. Kenneth Peck, a graduate of Duke University where he obtained his B.A. degree in 1953 and M.A. degree in Plant Ecology in 1954, joined the Garden staff last August filling a new post—that of helping make the Garden more useful and meaningful to its many thousand visitors.

The Friends of the Garden have as their Secretary, Miss Isabella Powell, who is also receptionist at the Main Gate Office.

Dr. Edgar Anderson, Curator of Useful Plants, returned to the Garden late in December and resumed his classes at Washington University at the beginning of the second semester. Last June and July Dr. Anderson participated in emergency teacher training courses for the National Science Foundation at Cornell University, the University of North Carolina, and Allegheny College. In August he was sent to Colombia, South America, by the National Research Council to expedite the work of Colombian and American agronomists who are describing and preserving for future use the varieties of corn in Bolivia, Chile, and other parts of South America. During his time in South America he was flown to Ethiopia by Oklahoma State University (formerly Oklahoma A. and M.) to aid a group of scientists who have established the first Agricultural and Technical School in Ethiopia and have just opened an Imperial Agricultural College there. Dr. Anderson's main job there was to assist in the study of important but little-known crops and to help work out research programs with Coffee, Sorghum and Wheat which would benefit both Ethiopia and the United States. In January he completed this assignment by three days of conferences with plant breed-

ers, directors of research programs and other administrators at Oklahoma State University.

The herbarium assistant at the Garden for the past year, Dr. Alfredo Cocucci, returned in October to the University of Cordoba, in Cordoba, Argentina.

Miss Nell Horner who has been librarian and Editor at the Garden for more than 30 years is now an assistant librarian at the St. Louis University Medical School Library. The many graduate students who had received her help in preparing their theses for publication in the ANNALS of the Garden, presented Miss Horner with a bound volume of letters and a gift of more than $600.00 in token of their friendship and esteem at a party given by Dr. Robert Woodson of the Garden and Dr. Harry Fuller, of the University of Illinois.

Dr. Frederick Meyer, former dendrologist at the Garden has gone to the U. S. Department of Agriculture Plant Introduction Center at Beltsville, Maryland, following an extensive plant-collecting trip last summer in the Mediterranean area of Southern Europe.

Dr Rolla Tryon and his wife, Dr. Alice Tryon, Fern Taxonomists formerly at the Garden, are now at the University of California at Berkeley, California.

During the summer of 1957 a horticulturist from Kew Gardens, England, Mr. Kenneth Beckett, worked for a few months at the Garden, then returned to England in the fall.

Since last January the national office of the Executive Secretary of the American Iris Society, Mr. Clifford Benson, has been located at the Garden in the old Shaw Residence.

The following degrees were awarded in the Henry Shaw School of Botany, June 1957: M.A. in Taxonomy to David Palache Gregory (A.B., Harvard University); M.A. in Taxonomy to Loren I. Nevling (B.S., St. Mary's College); M.A. in Mycology to Joseph A. Zammuto (A.B., Washington University). Robert H. Mohlenbrock, Jr., A.B. and M.S., Southern Illinois University, received the Ph.D. degree in Taxonomy in February 1957.

NATIONAL SCIENCE FOUNDATION SUPPORT FOR GARDEN RESEARCH

The Missouri Botanical Garden has received a grant of $60,000 for support of its herbarium and library facilities. This grant is to be used over a period of two years to pay for personnel, materials and equipment needed to put these research facilities in good working condition. In the herbarium new specimens will be acquired, mounted and added to the reference collection. More space and equipment will be provided for persons using the herbarium. In the library additional personnel will take care of cleaning and shifting books, and preparing them for binding. Books and periodicals will be purchased to fill gaps in our collection. A rare book room will be constructed to house the Garden's valuable pre-Linnaean and Linnaean collections and certain rare and oversize books which are now stored in crowded cases. Additional space, furniture and lighting will be provided so that the library can be used more readily.

The Garden is well-known to botanists throughout the world. Its technical publication, THE ANNALS OF THE MISSOURI BOTANICAL GARDEN, is sent to practically all of the important botanical centers of the world. In exchange and by purchase, the Garden receives more than 500 serials and reports. The National Science Foundation grant is a recognition of the value of the Garden's facilities for basic research in botany.

Although this support has been granted for a short time only, the National Science Foundation has been helping the Garden's research for several years by making grants for specific research projects. At the present time the largest grant to the Garden is one of $17,000 to support the study of evolution in plants directed by Dr. Edgar Anderson. Other grants from the National Science Foundation to the Garden include the following: Dr. Woodson's research project, the Flora of Panama, is aided by a grant of $15,000 over a three-year period to pay for assistants, artist's work and some publication and travel costs. Dr. Cutler's studies on the origins and development of corn and squash are aided by a grant of $4,700 to help pay for travel and an assistant. Small grants have been made the past few years to support the annual Systematics Symposium, a meeting of zoologists and botanists working on the naming of animals and plants.

FRIENDS OF THE GARDEN MEMBERSHIPS

One of the fastest growing things at the Garden today is the number of individuals and firms joining the Friends of the Garden. Back in 1953 when we let St. Louisans know about the increased need for financial aid we had 236 members making annual contributions. Today we have over 2,300. This public confidence in the administration of the Garden is a real inspiration to those of us charged with the responsibility of its future.

Membership in Friends of the Garden has been classified as follows: Annual, $5.00; Contributing, $10.00; Participating, $25.00; Sustaining, $50.00; Supporting, $100.00; and Life, $500.00.

Tell your friends about the various activities at the Garden. If they knew what could be accomplished with additional funds they too, would want to help make this the country's most outstanding Botanical Garden.

"HOLIDAY HISTORIQUE" PROFITS PRESENTED TO GARDEN

At the evening preview of the Annual Orchid Display, Thursday, February 6, Mrs. Arthur J. Kreuger, Treasurer of the Women's Committee for Shaw's Garden presented a check for $4,057.44 to Robert Brookings Smith, newly elected President of the Board of Trustees of the Garden, and Hugh Cutler, Acting Director of the Garden.

This money was raised by the Women's Committee at their fund-raising project, "Holiday Historique" held last fall in the Floral Display House, and will be used to restore and repair walls, fences, and ornamental ironwork in the Garden. The project not only served to raise money for these much-needed

repairs but also brought to the Garden a large number of visitors, some for the first time.

TO BE SEEN AT THE GARDEN

In the Floral Display House.—The Annual Orchid Display opened February 6 and will continue through March 16.

The Annual African Violet Show will be open March 22, 23.

The Easter Show will be held April 5, 6.

The Second Annual Daffodil Show will be held April 13, 14. Entries should be brought to the Display House before 10:00 A. M. Saturday, April 13. For information call Mrs. Grover F. Roennfeldt, PA 1-3645.

In the Linnaean House.—The Camellias (see Cover) have been flowering for over two months and will continue into March.

In the Garden.—Snowdrops and other early Spring flowers (see The Mausoleum Grounds Come to Life, page 1 of this issue), such flowering shrubs as *Hamamelis mollis* in Dr. Anderson's Garden, the many Jonquils and Daffodils which will be at their best in early April, and many more awakening outdoor plants will reward the seeking flower-lover.

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George B. Van Schaack.....Acting Curator of Herbarium
Trifon von Schrenk.....Associate Curator of the Museum
Robert E. Woodson, Jr.....Senior Taxonomist

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.

MISSOURI BOTANICAL GARDEN

Bulletin

Volume XLVI

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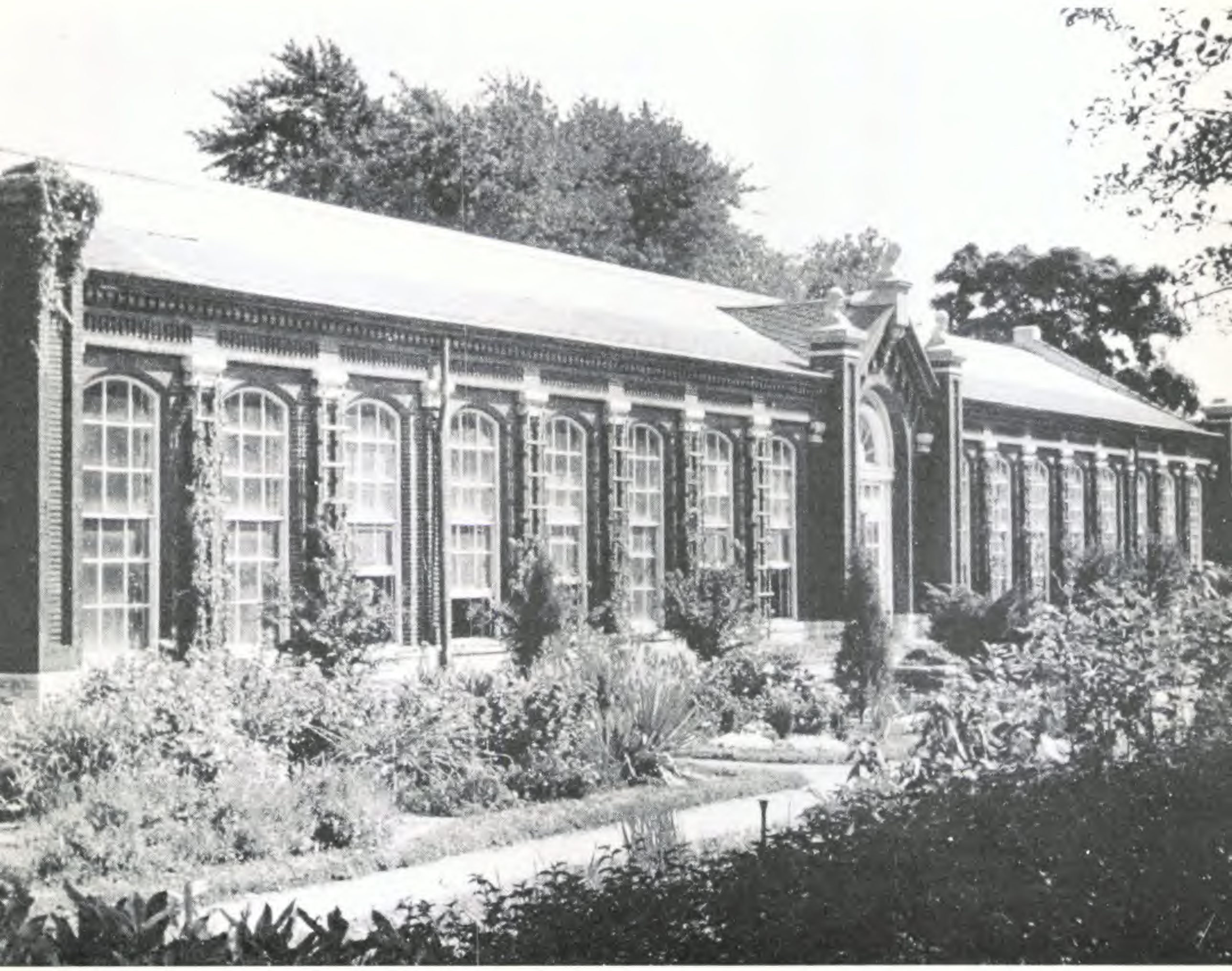
Number 2



CONTENTS

ERRATA: February 1958 Bulletin, Vol. 46, No. 1. Page 1, column 1, last line: the reference to Aconitum or Monkshood should instead read: Winter Aconite *(Eranthus hyemalis)* a member of the buttercup family. Page 1, column 2, last line: the reference to Pachystima *(Pachystima canbyi)* should instead read: Japanese Spurge *(Pachysandra terminalis)*.

COVER: The Linnaean House, the only remaining greenhouse built by Henry Shaw. For the last two years the proceeds of the GARDEN TOURS (arranged by the Garden Club of St. Louis providing an opportunity to see some of the outstanding St. Louis Gardens) have been used to restore the Linnaean house. Restoration work will be continued this year with the proceeds from the 1958 Spring Garden Tours to be held Friday, Saturday and Sunday, May 2, 3, and 4, from 10:30 a. m. to 5:30 p. m. Eight St. Louis gardens will be open; four of the homes also will be open. For information call Missouri Botanical Garden, Main Gate, PR 6-1785. Tickets may be obtained for $2.00 at the Main Gate of the Garden and by mail from Mrs. John Lehmann, 10 Apple Tree Lane, St. Louis 24, Missouri.

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Missouri Botanical Garden Bulletin

Vol. XLVI No. 2 MARCH, 1958

THE GARDEN REPORT FOR 1957

HUGH C. CUTLER

THE year 1957 was an eventful one at the Garden with the successful accomplishment of many plans. A good botanical garden combines research and planning with demonstrations of these activities in plantings and displays and in publications and lectures. The wide range of the Garden's work can be illustrated by two of the most important events at the Garden in 1957. The first directly concerned the research staff although it will eventually help improve all of the Garden; the second concerned grade school children, inducing many to visit the Garden for the first time.

A committee of distinguished botanists from some of the most active institutions in the United States investigated the needs and activities of the Garden research facilities and, after their recommendation, the National Science Foundation granted $60,000 for work to be done in 1958 and 1959 to rehabilitate the library and herbarium. A considerable number of research projects at the Garden are supported by grants from the National Science Foundation but this is the first time that support has been granted for the facilities which make our research possible. This grant is important because it indicates a recognition of the value of the Garden to the nation's research program. Our plant collections and library are used not only by our own research staff but by many visiting scientists and, when sent on loan to accredited institutions, by research workers throughout the world.

It is likely that, of all the things done at the Garden last year, the initiation of a planned program for grade school children will have the greatest effect in the future. Interests and character traits are usually formed in youth. Children are naturally curious; they love to name things and to make collections. Through the Garden's educational programs these traits can be directed and a lifelong interest in plants, and nature in general, be stimulated. The response to the first program, a "Tree Trail," showed that both students and teachers enjoy and profit from a well-planned project. Some adults asked for the guide sheets to the "Tree Trail" because their children were so enthusiastic about their visit to the Garden. A grant from the Pitzman Fund made it possible to begin this program. Volunteer help and more funds will be used to expand this program in 1958.

Many of the changes which were planned for 1957 could not be made. Plantings planned for the spring were delayed by the rains. Some staff positions were not filled because people with the necessary qualifications could not be found. There was much evidence of an emphasis on the kinds of

things which make a botanical garden differ from a park or a private garden. New kinds of plants were displayed whenever possible, usually labeled with some information in addition to the name; and often planted in groups or shown so they could be compared with related plants. There were more lectures, flower shows, garden club meetings, and more help was provided for special groups. The extent of many of these activities was severely limited by the size of our staff. The Garden probably has fewer employees now than ever before, yet everyone is working as hard and intelligently as possible so that much is accomplished. Mr. Oscar Glaessner, Secretary of the Board of Trustees and Controller, made improvements in our records and by his management of business details made it possible to save significant amounts of money. A tremendous amount of work of all kinds has been done by volunteer helpers and the number of volunteers continues to increase.

It is imperative that more funds be obtained in 1958. Our staff working in research, education and plantings is small and largely underpaid. Many of our greenhouses, buildings, pools, waterlines, trellises and benches are in serious need of repair or replacement. Our grounds crew is able to spend only a small amount of its time on replacing old or poor plants. One of the greatest needs is for a functional entrance where people can learn what a Botanical Garden is and how to derive the most pleasure from their visit.

RESEARCH ACTIVITIES AND FACILITIES

For several years informal discussions have been held to plan the activities of the research division of the Garden. In 1957 a Research Committee was organized with all of the active research workers of the Garden and the heads of the botany departments of St. Louis University and Washington University as members. At the monthly meetings plans are discussed for the improvement of the research program. This committee takes over all the functions of the previous Library and Herbarium Committees.

The Fourth Annual Systematics Symposium was supported again (for the third time) by a grant from the National Science Foundation. Dr. Ernst Mayr, Columbia University, and Dr. Carl Epling, University of California, were the invited chairmen. The Symposium was arranged by Dr. Woodson with the help of Dr. Van Schaack and others of the staff. At one time there were 203 people present, many of whom participated in discussions of the problem of classification of plants and animals. This Symposium is an important activity, bringing workers in the field of systematics, along with large groups of their students, to the Garden. It is an opportunity for the exchange of ideas; and the stimulation of these discussions results in better work by all the participants.

Dr. Anderson spent several months in the early part of the year as a Fellow in Mathematics at Princeton University, working on his semigraphical methods of analysis. During the fall he worked in Colombia on the classification of some South American maize for the National Research Council and,

Dr. Anderson studying a native giant cane grass *(Gynerium sagittatum)* in Colombia.

while there, he was sent by Oklahoma State University to the new agricultural school, which they have helped to establish, in Jimma, Ethiopia, to confer with the staff on problems concerning native crops. Dr. Anderson returned to his work at the Garden in December. He has received a grant of $17,000 from the National Science Foundation for support of his studies on hybridization in plants for a period of three years.

Dr. Woodson is active in teaching at Washington University; while at the Garden he has been busy with studies on the Flora of Panama, which is currently being supported by a grant of $15,000 for three years by the National Science Foundation.

A grant of $4,700 for two years from the National Science Foundation is aiding Dr. Cutler in his studies on the origin and dispersal of maize and cucurbits in the Southwest.

A considerable amount of research work is done by staff members who are

concerned with displays and plantings. Without research the Garden would become static and would no longer be a Botanical Garden. New plants are sought and tried at the Garden in the hopes of finding those that would be valuable additions to the gardens of this region. Other plants are grown so that the variation in the groups to which they belong can be studied, or simply so that they may be seen by visitors. Most of the new plants for outdoor plantings are tried or propagated at the Experimental Greenhouse, which work, since August, has been done by Mr. Edgar Evinger.

Three research projects of special interest to the St. Louis region are Mr. Viktor Muehlenbachs' studies on the native and weed flora of St. Louis and vicinity, Dr. Julian Steyermark's continued work, nearly completed, on the Flora of Missouri, and studies on hops made under the direction of Dr. Edgar Anderson and supported by grants from the Brewing Industries Research Institute.

LIBRARY

Library work for 1957 was chiefly devoted to cataloging and binding. By the end of the year the large backlog had been completed and current cataloging was practically up to date. Some thousand periodicals and numerous books were added to the library. Notable among these was a set of the botanical articles from the early issues of the Memoirs of the Paris Museum of Natural History which appeared in the early part of the nineteenth century. Although over 600 volumes were bound the backlog of material needing binding or repair is still very large.

A program of revising the publications exchange list was initiated with a questionnaire sent to some 500 institutions throughout the world. Replies, which were still being received at the end of the year, will be used to correct our exchange list so that our publications will still go all over the world and we will receive mainly only those publications of real value to the Garden.

A new system of journal checking involving the use of visible files was instituted. This system has been a genuine time-saver. During the summer a temporary assistant replaced hundreds of old pamphlet covers and did other needed "shelf-housekeeping." Early in the year Mrs. Virginia McMahon took over the duties of secretary for the library and publications.

HERBARIUM

In the herbarium the usual duties of loaning, borrowing, accessioning and inserting specimens continued. Some painting and repair work has been done to make it a more pleasant place to work.

The principal figures for herbarium activities during 1957 follows:

Specimens inserted	3,360
Specimens accessioned for future mounting	4,159
Specimens sent out in exchange (to 10 institutions)	2,497
Specimens loaned (to 20 institutions, 4 foreign)	4,817
Specimens borrowed (15 institutions, 10 foreign)	2,625

The position of herbarium assistant was held by Dr. Alfredo E. Cocucci of Cordoba, Argentina, until October 1. During the remainder of the year the position was vacant. A significant

part of herbarium insertion during the year was done by Mrs. Frederick Comte, who devoted several hours of voluntary work to this detail each week. Our collection of nearly 10,000 negatives of type-specimens was revised and filed in strong fibre-board boxes donated by the St. Louis Paper and Box Company and the Gaylord Container Corporation. In addition to the usual mounting a program of going through our collections and repairing old mounting was begun.

This work has been carried out under the direction of Dr. Van Schaack, the Acting Curator of the Herbarium, and Miss Margaret Carroll, Secretary of the Herbarium.

THE TOWER GROVE GARDEN

Grounds Maintenance and Plantings.

During 1957 the grounds crew (under the direction of Grounds Superintendent Louis Brenner and his foreman, Joe Baker) was occupied chiefly with routine maintenance, although considerable progress was made in rehabilitation work. Improved methods of gardening, such as the use of mulches, the spacing of shrubs and new plantings to permit faster machine mowing and to eliminate hand trimming, and the removal of aged, unsound, or crowded trees which drop branches during heavy windstorms, greatly reduced the number of hours spent on maintaining the grounds. The Rose Garden, Linnaean Garden, Italian Garden and certain borders still require large amounts of hand work. In the Rose Garden some beds have been combined to eliminate the amount of edging; and mulches are used to conserve water, cover weeds, and keep down blackspot and the damage from soil splashing. Many of the roses have been obtained as gifts or at low prices by members (especially Mr. Francis R. McMath and Mr. John Nies) of the Rose Society of Greater St. Louis. In the Italian Garden many small areas were united and the borders were replanted with Forsythias, Junipers, Star Magnolias and Bamboos, then heavily mulched.

The grounds about the Museum were planted with Hollies following the design of Landscape Architect Emmett Layton. The nearby lawn areas were graded and covered with a wild hay mulch which contained a large amount of the Arboretum strain of blue grass. Contributions from many of the Federated Garden Clubs of Missouri made it possible to do this work.

Work continued on the removal of undesirable trees, mainly Silver Maples, Elms, Sycamores and Trees of Heaven that had sprouted as volunteers many years ago. Many of these trees were near buildings, structures, or along the stone wall on Tower Grove Avenue, where they were weakening the structures as well as crowding and deforming more desirable trees. The entire crew spent about ten days cleaning out weeds, old brush and dead or undesirable trees along Alfred Avenue and surrounding the Lake. About half of the walks were resurfaced in August, in preparation for which it was necessary to cut away the sod bordering the walks so that the new surface could go out to the very edge. In the fall many of the plants in the

Experimental Greenhouse nursery were planted out to replace the old and dead ones which had been removed.

In addition to the regular maintenance, the grounds crew has collected trash, moved properties for many special functions and for the various flower shows, and on rainy days helped with the maintenance of buildings, repaired tools and other equipment, and done various other jobs which have turned up.

GREENHOUSES.

Flower Shows and Displays: The annual flower shows are an important part of the Garden's busy schedule. In January the Poinsettias were replaced by "Snow" Mums. Later, Primroses, Cyclamens and Buddleias were added.

The regular Orchid Show opened with a preview for the Friends of the Garden on the night of February 7. The focal point of the design was a small plastic-covered greenhouse which housed easily-grown orchids and various supplies for their successful culture. The Orchid Show closed March 25th and was followed on March 30 and 31 by the African Violet Show sponsored by the local Society.

Our Easter Display opened April 3, featuring Croft Lilies, Nasturtiums, Azaleas, Cinerarias and other appropriate flowers. The Show continued into May with weekly replacements of fresh material. In early April the balcony of the Floral Display House was the scene of a Daffodil Show, the first of its kind staged in the Garden. The St. Louis Horticultural Society presented its Spring Flower Show on May 18 and 19 and the following weekend the Rose Society held its Rose Show.

Flowers were provided to decorate Christ Church Cathedral for the Annual Flower Sermon which is given as directed in Henry Shaw's will.

During the warm summer months only a small display, mostly of exotic foliage plants, is maintained in the Floral Display House.

Three important shows were staged during September: the Fall Cactus Show (September 14–15), the Harvest Show (September 21–22), and the Dahlia Show (September 28–29).

The day following the Veiled Prophet's Ball, his Queen's bouquet was placed on exhibit. A second bouquet was prepared for the Queen's visit to the Henry Shaw Home on October 5th to receive school children.

The Women's Committee of Shaw's Garden helped with many events during the past year. Their third major fund-raising project was called "Holiday Historique" and subtitled "The Mayflower Comes to Shaw's Garden." It brought many people to the Display House, where a wide variety of exhibits emphasizing ideas for home holiday decorations were displayed in an attractive garden setting. The proceeds of this project, $4,057.44, will be used to repair and restore the many fences, walls and ornamental iron work structures which need immediate attention.

The Women's Committee also arranged the receptions and refreshments for the previews of the Orchid and Chrysanthemum Displays and for the special showing of the research facili-

ties and research work of the Garden on May 9.

Immediately after the closing of the very successful "Holiday Historique" everyone worked to install the annual Chrysanthemum Show in record time so it could open on November 7 with a preview for the Friends of the Garden. The Display was designed by Kimio Obata and Associates and the installation was directed by Floriculturist Paul Kohl. After six weeks, the Mum Show was followed by the Poinsettia Show.

Maintenance: The routine work of propagating, planting, feeding, spraying and watering was performed as in other years. In order to let visitors know more about the plants, a large number of descriptive labels were prepared by Greenhouse Superintendent Lad Cutak. When outstanding plants came into flower, or were acquired, they were displayed in special places with informative labels.

Outdoor Pools and Annual Plantings: Heavy rains delayed planting in the flower beds and the Italian Garden and many areas had to be replanted because the first plantings were flooded. Weeding, spading and planting was not completed in the Italian Garden and flower beds until mid-June.

The pools in the Main Garden, where our best waterlilies grow, were lined and staked on May 6th and planted with 75 waterlilies. The center pool was left unplanted and treated with sodium arsenite to eradicate the weeds, mainly Sagittaria, which had become a problem. A jet of water was used to decorate this pool. The lilies for the outdoor pools are started in tanks in greenhouses in January and shifted into larger pots as needed. These plants begin to flower in late March and April and so this portion of the private houses was opened to the public until the waterlilies in the pools bloomed.

MAINTENANCE AND HEATING.

Many Garden structures are in such bad condition that major repairs, or even replacements, will be necessary. Our staff can barely keep up with current maintenance, and catching up on an estimated $400,000 of repairs and replacements is done mainly with special gifts. The south half of the roof of the Linnaean House was completely redone with funds raised by the Spring Garden Tour of the Garden Club of St. Louis. The old slate roof of the Museum was replaced with the best composition material available and parts of the roofing of the Administration Building were replaced. This work was paid for with funds raised by the Women's Committee. Most of the pergola in the Italian Garden was painted. More than half of the walks in the Garden were surfaced during the summer. This new surface will close cracks so water can no longer enter and freeze and break the walks.

For many years we have expected the old heat transmission line from the Boiler House on the north end of the Garden to the Administration Building, Shaw Home, Experimental Greenhouse and Museum to break. A study of the costs of replacement or of installation of one or four separate boilers for these four buildings was made and the best solution was to install

individual heating units. These units are in use now and we are no longer dependent on the long, wasteful and old transmission line.

THE ARBORETUM

Careful planning and hard work on the part of Superintendent of the Arboretum, Frank Steinberg, has reduced costs there so that they are less than half of what they were during the past few years. Many small operations which do not properly belong in an Arboretum were eliminated. The cattle and sawmill have been sold, farming on the south side of the river has been practically stopped and the pastures and arable land were placed under Soil Bank and Soil Conservation plans which yield a cash return and pay for part of the expenses of improving the land. Forty-six acres were plowed, limed, fertilized, disked and sowed with fescue and lespedeza.

Particular attention has been paid to the area about Pinetum Lake, for this main drive is open to the public the entire year. All planted groups were cleared of brush and weeds, the trees were pruned and dead ones removed. The trees will grow better now and the naturalized daffodils will make a more striking display.

Six hundred hours were spent mowing, fifty-one loads of brush were hauled away and seven loads of chips were used for mulch. Repairs were made to some of the equipment and the doors of the service sheds were repaired and painted. A large number of Redbud and other plants were dug for planting in the Tower Grove Garden.

The heavy spring rains washed some of the main roads badly and eighty hours were spent working them with the grader. Cinders from the orchid greenhouse boilers and 250 tons of crushed stone were added to the worst places.

Each Easter for many years a sunrise service has been held at the Arboretum. The long circle drive past the trailhouse is open to cars only during April and the first half of May. This is the time when the Daffodils, Redbuds, Dogwoods and other wildflowers are at their best. During the rest of the year visitors are encouraged to walk along the trails and roads beyond the Pinetum area.

THE ORCHID DEPARTMENT

In 1957 the major endeavor in the Orchid Department at the Arboretum was to eliminate large numbers of duplicate plants and poor quality plants, to acquire new kinds of orchids, to perform research essential for a sound breeding program and further research, and to study and employ the best cultural methods.

RESEARCH.

Investigations on the use of weed killers continued. Trials of orchids cultured in fir bark in both open benches and in pots showed that weed control was practical. Studies on the control of flowering time of orchids by regulating the length of day were continued. Chromosome studies on some of the important Cattleya stud plants were made and the information added to our chromosome atlas, the only collection of this sort of data which is being kept, as far as we know. Such cytological observations make it

possible to use our valuable parent plants more intelligently in the production of new hybrids.

CULTURAL TECHNIQUES.

About seventy per cent of the orchid collection is now potted in fir bark and eventually all of our plants, except for the few that are grown in baskets or on rafts, will be grown in this medium. Humidity control and evaporative cooling is used to decrease summer temperatures. The collection of Ladyslippers (Cypripediums) produced about twice as many flowers as in previous years and the plants are more vigorous than before; this is attributed to the better cooling, the moisture control and the use of fir bark as a potting medium.

PLANT BREEDING.

Many inter-specific crosses were made, using some of our rare and unusual orchids as parents. These crosses involved such genera as Oncidium, Miltonia, Cattleya, Catasetum and Cynoches. The cross made between these last two genera had not been made before.

NEW PLANTS.

Last year 349 new plants were added to the collection. Most of these were species or unusual types. Three collections acquired were particularly noteworthy: 1) a fine collection of species received in exchange from Sherman Orchid Gardens at Glendora, California; 2) a shipment of unusual species given by Mr. Jose Strobel of Ecuador; 3) a group of modern cymbidium seedlings received in exchange from the Dos Pueblos Orchid Company of Goleta, California.

The Orchid Department, under the direction of Mr. Robert Gillespie, has been located at the Arboretum at Gray Summit since 1926 when the orchids were moved from St. Louis because of the damaging city smoke. With the success of the St. Louis smoke control program, it is now possible to grow orchids in St. Louis; consequently, the orchid growing and research will be moved back to St. Louis, a change that will be completed by September of 1958. In the city more people can see the orchids and a really active research program can be carried on, since the library, herbarium and laboratories are convenient and it will be possible for Mr. Gillespie to consult more frequently with other members of the Garden staff.

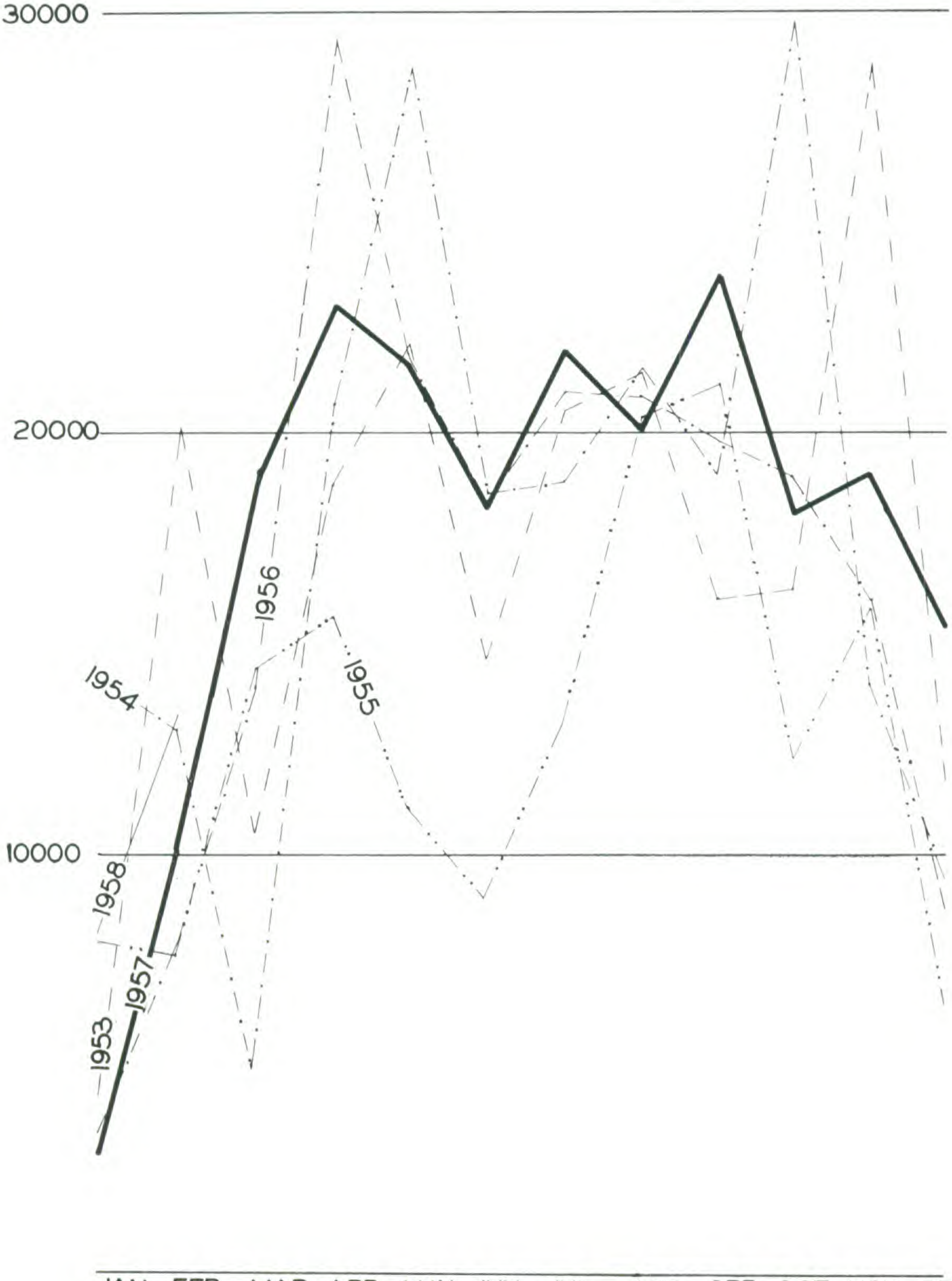
ATTENDANCE

Attendance last year was the largest it has been for several years: the Garden was visited by 217,419 people. Attendance figures for the past five years are:

1953	207,988	1955	156,297
1954	215,045	1956	198,472
		1957	217,419

These figures represent only the people who enter through the main gate turnstiles. Increasing numbers of people enter through the Cleveland Avenue entrance or the service entrance.

A graph of attendance by months shows that the peak months usually are April, May, or September. These are the months when our outdoor gardens are at their best. In April and May the lawns are bright green and many trees, shrubs and small plants are in flower. In September and October the waterlilies and Italian Gar-



Graph of attendance by months at the Garden.

den are at their best and the Rose Garden has a second spurt of bloom. Our Camellias bloom in February and March at the time of our Orchid Display and our Chrysanthemum Show is in November. We are trying to add to the beauty and interest of the Garden in summer by introducing plants which bloom at that time and by increasing the number of kinds of trees. For winter we are adding more broadleaved evergreen shrubs and trees and using ivy and other evergreen vines for ground covers. Clear, accurate and informative labels make plants more interesting any time of the year.

Volunteers of the Regional Council of Men's Garden Clubs, under the direction of Mr. Arthur J. Krueger, reset and repaired the labels on many of the trees and shrubs. A large number of very interesting educational signs were prepared by Mr. Paul Hale.

PUBLICITY

Many people and organizations have helped in projects to improve the Garden, to attract visitors and to show them what the Garden is doing. Most of our publicity has been managed by Mr. Rollo Horwitz. Ten volunteer guides, under the leadership of Mrs. Paul Britt, conducted 54 special groups of visitors through the Garden. Members of our staff and the Horticultural Council have lectured to many groups and given information to amateur gardeners and students. When groups ask for a speaker from the Garden we try to encourage the group to visit the Garden and have them talk among the living plants rather than have a member of our staff travel to their meeting place and show slides of the plants.

Mrs. Hazel Knapp is in charge of the Horticultural Consultants who are trained at the Garden to answer gardening questions. This group has done a good job and taken care of many requests which the Garden staff is not large enough to handle.

A valuable gift to the Garden is the help of the many hostesses for the Shaw House. Members of the Eighth District of the Federated Women's Clubs serve from one to four each day except during January, February and December, when the Shaw House is open only on weekends. Mrs. Arthur J. Krueger and Mrs. George Pring are in charge of the arrangements with the clubs for hostesses.

An excellent color film of the Garden was made by Mr. Frank McCready. He has shown this before several groups at the Garden and at a large number of dinners and special meetings in the St. Louis area.

INSTRUCTION

All of our classes in bulb forcing, spring horticulture and plant propagation were taught by Mr. Clarence Barbre, one of the best gardeners of this region. He not only knows a lot about plants but can teach in such a lively manner that empty seats are rare in his classes. Mr. Gillespie taught the course in orchid growing.

Mr. Kenneth Peck laid out two programs for grade school children and these were used by a large number of classes and groups. In a trial of plans for future programs two grade school classes planted bulbs under Mr. Peck's supervision: each pupil provided his own container, a tin can, and planted

two Paper-white Narcissi bulbs after learning what a bulb is, how it grows and how to plant it at home outdoors. The bulbs were delivered to the school and the pupils took them home to flower about Christmastime.

Garden demonstrations and tours were given during the fall on Wednesday and Saturday afternoons. Experts on Iris, Daffodils, Waterlilies and African Violets gave demonstrations; and staff members conducted tours of the new developments at the Garden. Dr. Anderson and Dr. Van Schaack conducted their popular grass walks through the Garden. The St. Louis Academy of Science held two of their series of public lectures at the Museum Building with Dr. Anderson and Dr. Van Schaack as guest speakers.

The National Council of State Garden Clubs: Ground breaking ceremonies for the permanent home on the Magnolia Avenue side of the Garden were held May 11th and were attended by Mrs. Daniel Mooney, president of the National Council, Mrs. William J. Walters, chairman of trustees of the Permanent Home Endowment Fund, Mrs. C. G. Spillars, chairman of the site selection committee, members of the Garden's Board of Trustees and staff, and representatives of many Missouri Garden Clubs. Building was delayed by the wet early summer and cold winter but the stone siding is now being added and the major part of the structural work is done. In November of 1957 there were 10,905 clubs with 361,376 members in the National Council, making this the largest of all groups of organized gardeners.

MAIN GATE

Many important activities are carried on at the Main Gate Information Center. Superintendent George Pring takes care of the many questions which are asked over the telephone or by visitors. Miss Powell helps visitors find the most interesting features of the Garden, sells postcards and books and pamphlets on plants, and is Secretary for Friends of the Garden. Mr. Dudley French and Mr. Towner Deane are in charge of the Friends of the Garden. Members of many garden clubs and of the Women's Committee addressed more than 17,000 envelopes for the mail campaign for new members. The 2,217 members contributed $25,618.87 during 1957. The Garden receives no support from taxes and depends on these gifts to do many things which could not be done with only the funds from Henry Shaw's endowment.

Bequests to the Missouri Botanical Garden may be made in securities, money, or books. They may, if desired, take the form of a memorial to a person, to be named by the giver.

Bequests to the Garden by will are deductible, without limit, in determining the federal estate tax and are exempt in any amount from Missouri and Illinois state inheritance taxes.

For bequests to the Missouri Botanical Garden, the following form is suggested:

> I do hereby give and bequeath to the Trustees of the Missouri Botanical Garden of the City of St. Louis, State of Missouri:

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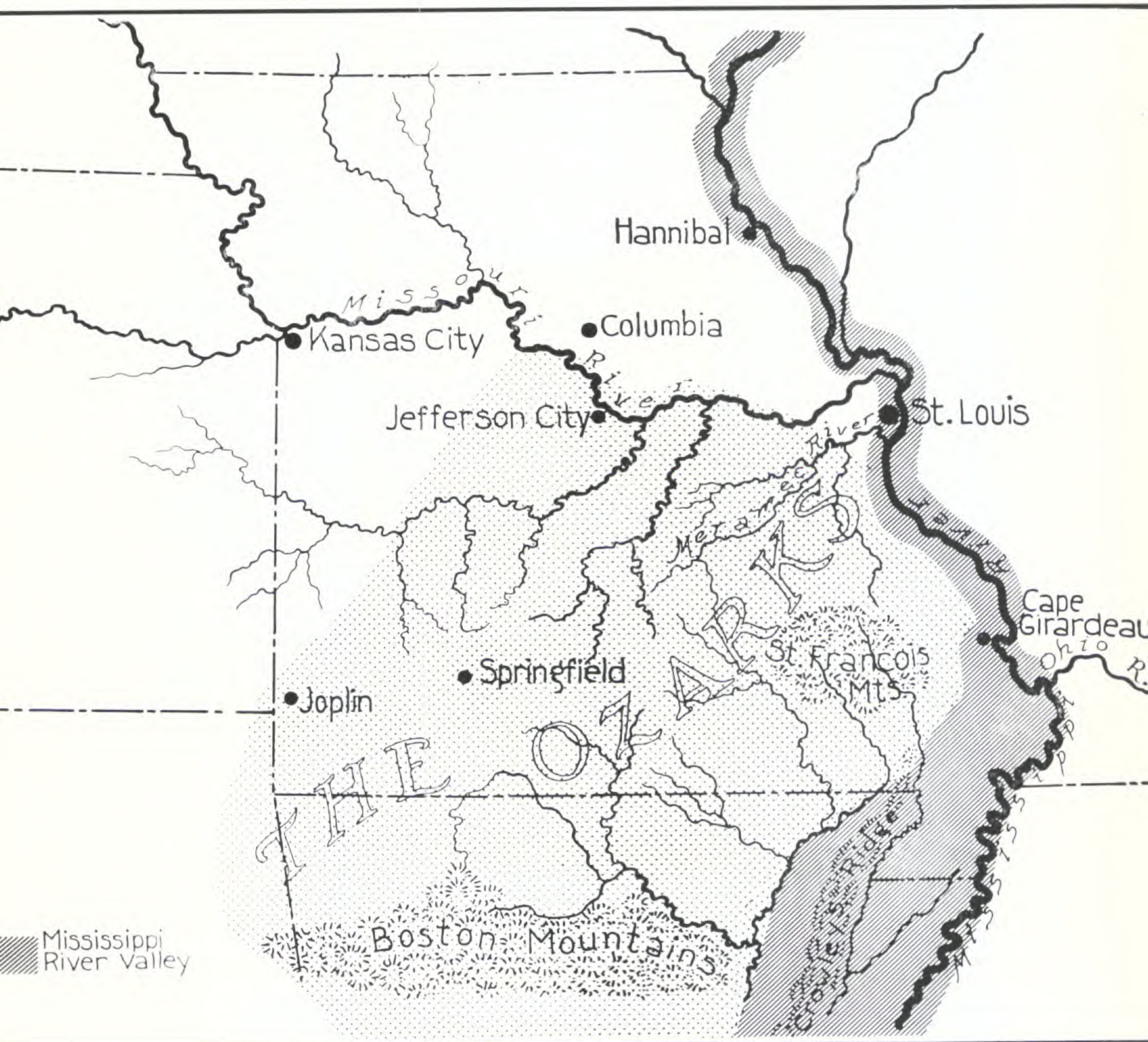
SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.

Spring Flowers of Missouri and How to Know Them



MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XLVI APRIL 1958 NUMBER 3

A greatly enlarged picture of *Erigenia bulbosa* (Pepper and Salt). See the tailpiece for a habit sketch showing how these plants bloom down among last years' dry oak leaves.

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SPRING FLOWERS OF MISSOURI AND HOW TO KNOW THEM

EDGAR ANDERSON, DRAWINGS BY BERNADETTE VELICK

HOW TO USE ANY GOOD BOOK ABOUT WILD FLOWERS

THE average St. Louis amateur who buys a copy of Steyermark's SPRING FLORA OF MISSOURI takes it home thinking "Now when I spend a weekend in the Ozarks I'll have a book which will tell me all those plants I don't know". If the amateur is really interested at all, this is the very worst way to use the book. There are something like a million kinds of flowering plants in the world; no book is going to be able to help anyone identify very many of them right off. The best way to use any good book about wild flowers is to STUDY THE PLANTS YOU ALREADY KNOW.

Surely you know a buttercup when you see it. Well, look up BUTTERCUP in the index and you will find that Missouri has more kinds than you probably suspected. Now put the book aside and sit down and spend at least half an hour studying your special buttercup—the leaves, the flower, the stem. A reading glass or a hand lens will help you. Never mind if you do not know any names for the various parts of the flower; anything which you find on more than one plant is probably significant. You will find this half hour rewarding in many ways. The plants you live with have more variety and charm than you ever suspected before you took a really good look at them.

With this experience behind you turn back to Dr. Steyermark's invaluable book. Look at the pictures and see if you can decide from them just *which* Missouri buttercup you have in your hand. Then read what he has to say about it. Read what he has to say about buttercups as a whole—the genus Ranunculus. Some of the fancy words he uses will be new to you. Look up their meaning; you're going to run into them again. After having looked for half an hour at strange little things in the flower with no name in your head to pin them down with, it will be a relief to find such useful concepts as CARPEL, SEPAL, and PISTIL. Never mind if you cannot yet make out what every word means. Have you ever tried to read a foreign newspaper? If you have, you know it is possible to read along in a foreign language skipping over the words you don't know or only half way understand and still get a good deal out of the account. You will also have learned that it pays to sit down from time to time with a good dictionary and look up those words which keep recurring and that do not mean anything at all to you.

Set yourself a simple goal. Every time you go to the country look up one plant you know. Spend the weekend learning all you can about this fellow-Missourian you previously took so much for granted. After about five or six such sessions you will find you

are seeing plants with a new eye. It will be as if you had previously gone through the world with Vaseline smeared over your glasses. Having really looked at a Dog-tooth Violet and learned why it was in the Lily Family, you will understand the Wild Hyacinths when they open, and will surprise yourself by saying "Why, I do believe that must be in the Lily Family". Next summer when you go out to the Rockies you will find few of the plants which are in Dr. Steyermark's book but if you have spent ten week-ends studying ten plants that you thought you knew AND REALLY GOT TO KNOW THEM, you will find that though the Rocky Mountain flowers are strangers, they are mostly close relatives of old friends. You will have the satisfying feeling of knowing your way around. Your best teacher is yourself.

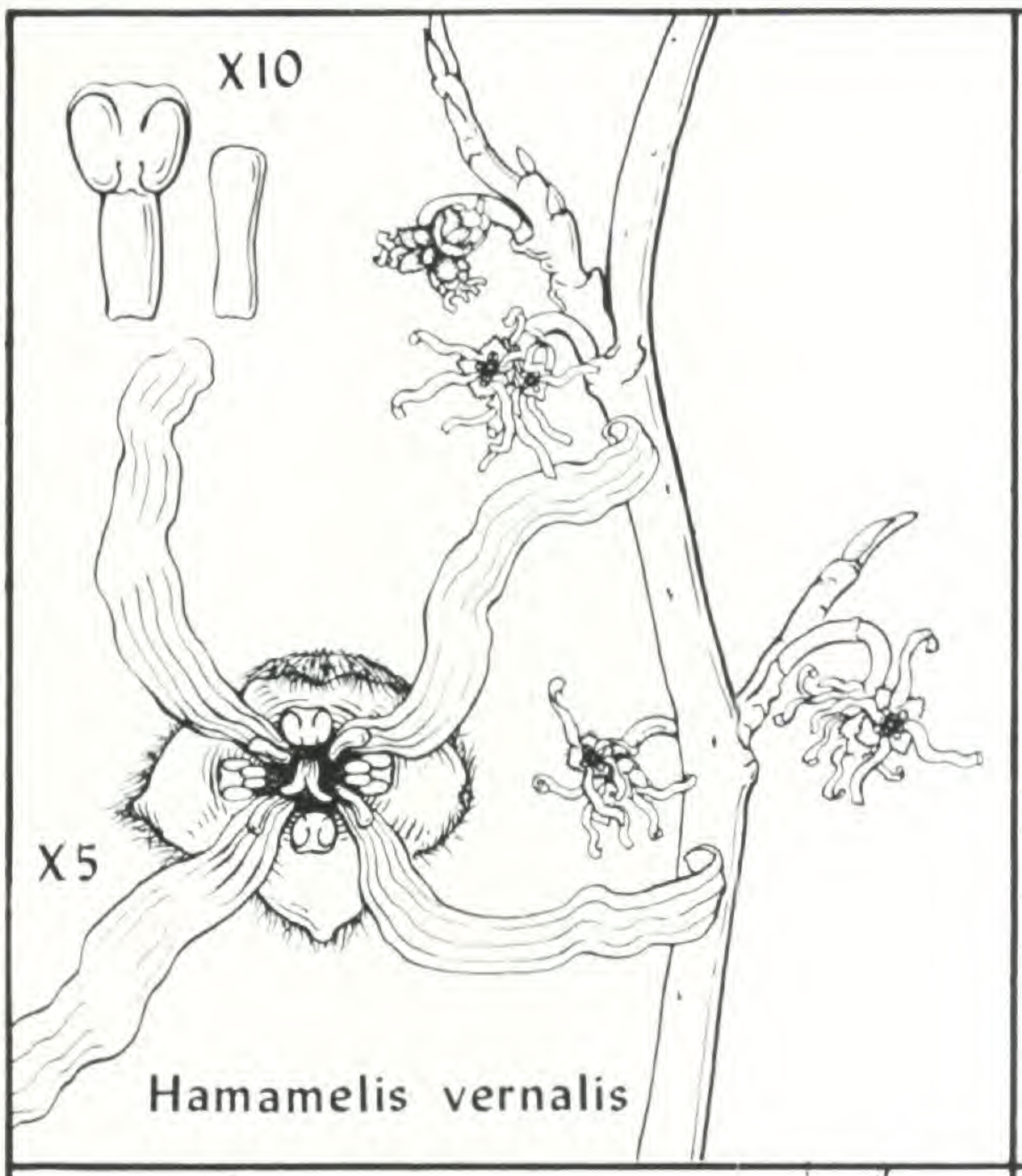
THE LANGUAGE FOR THE FLOWERS

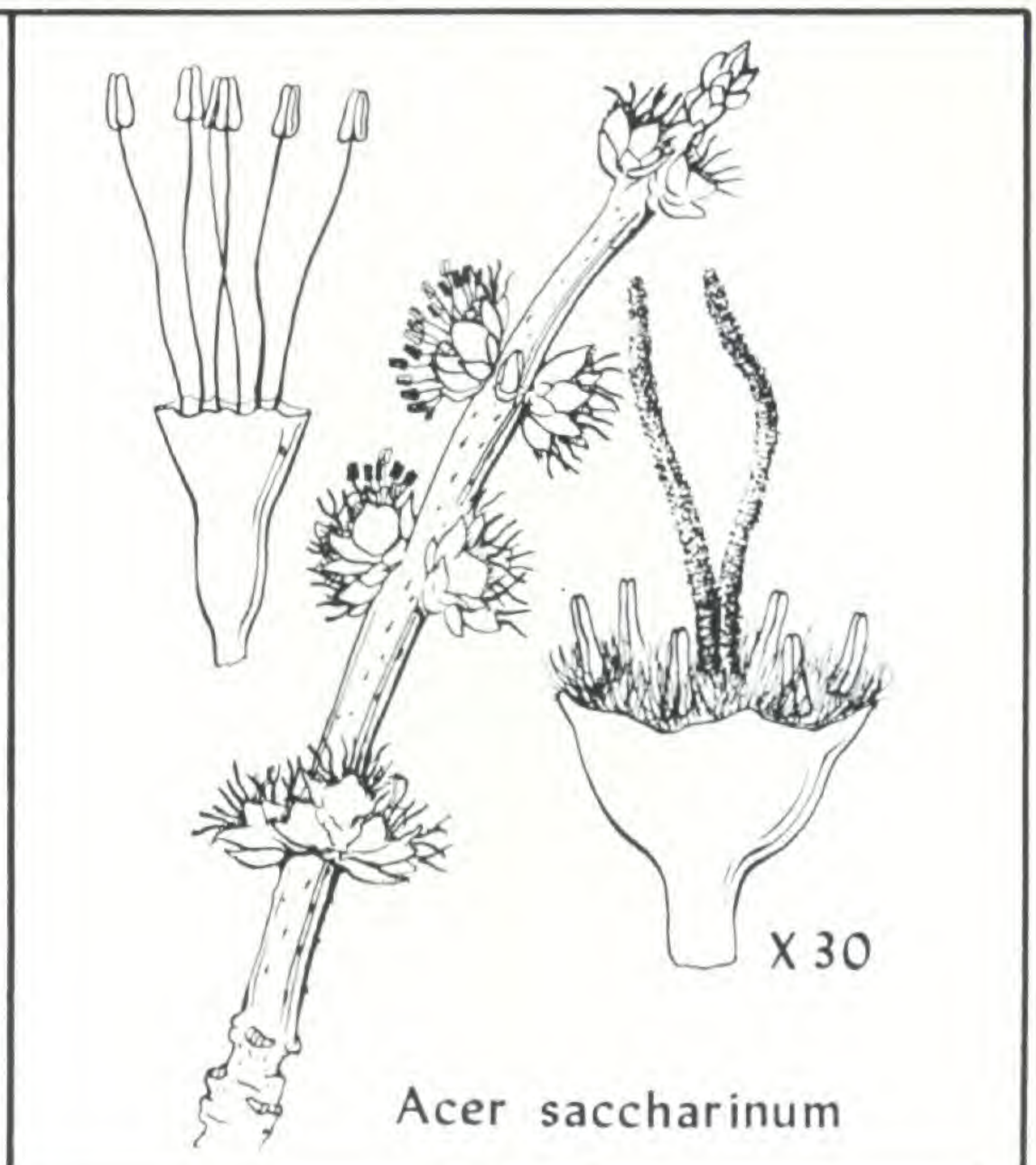
Though they may not look it at first sight, different kinds of flowers are built up out of the same kinds of units. If you really want to understand them and to find out about them from books, you will have to learn nearly as many technical terms as you did when you first learned to drive an automobile. Here, in the accompanying chart, is THE ABSOLUTE MINIMUM. There are twelve terms that you really must know: sepal, calyx, petal, corolla, stamen, carpel, pistil, filament, anther, ovary, style, stigma.

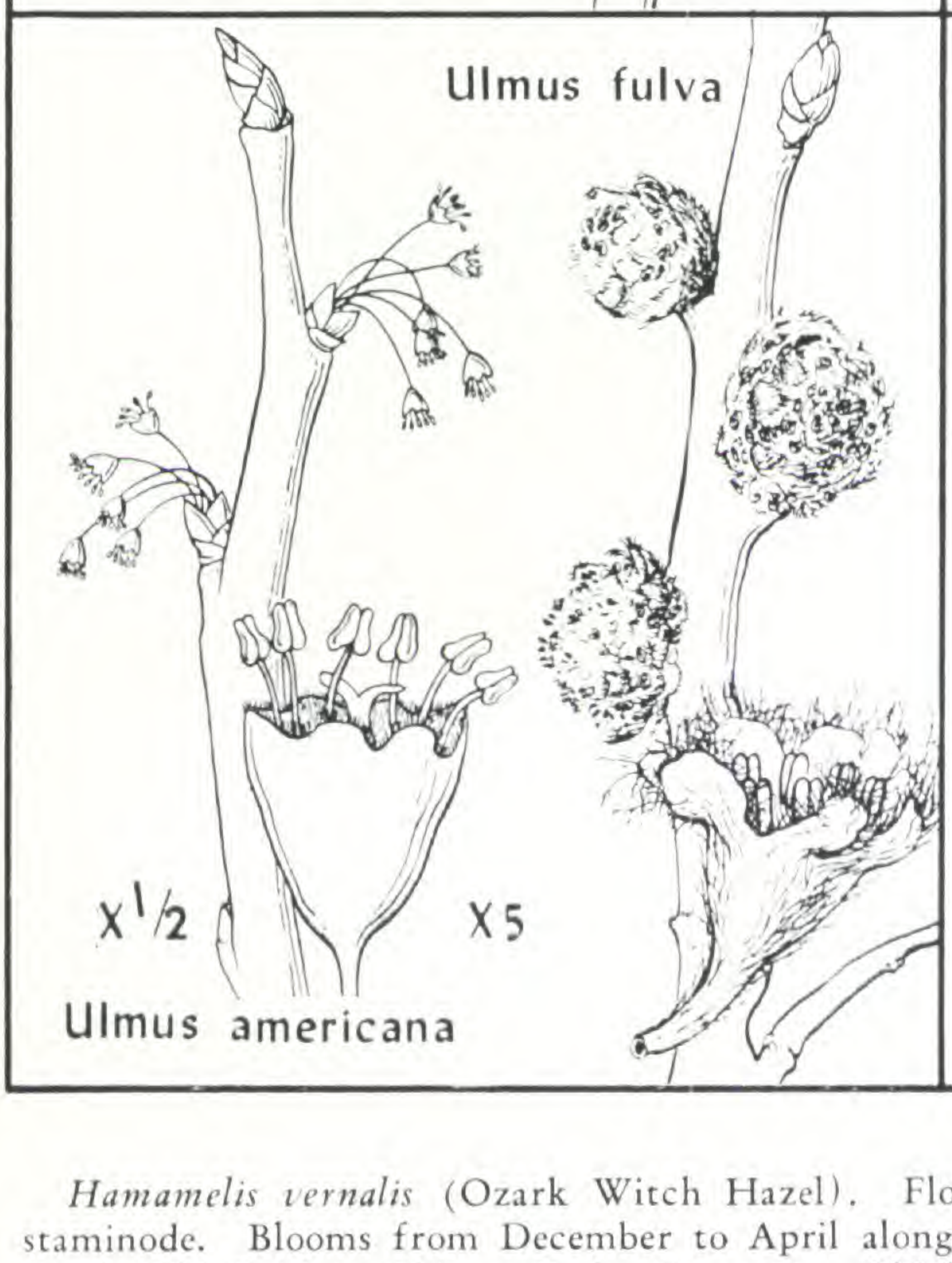
Study the chart carefully. Most educated people know that the *corolla* is made up of *petals*. In just the same way the *calyx* is made up of *sepals* and the *pistil* is made up of *carpels*. When you see the words, "carpel" or pistil" in a book and do not understand them, look at this simple chart. Just as a corolla is made up of petals, either separate or fused together, so a pistil is made up of carpels which may be more or less separate or so fused that you will have to hunt very carefully to find any evidence of individual carpels. (Words in brackets are less useful to the amateur.)

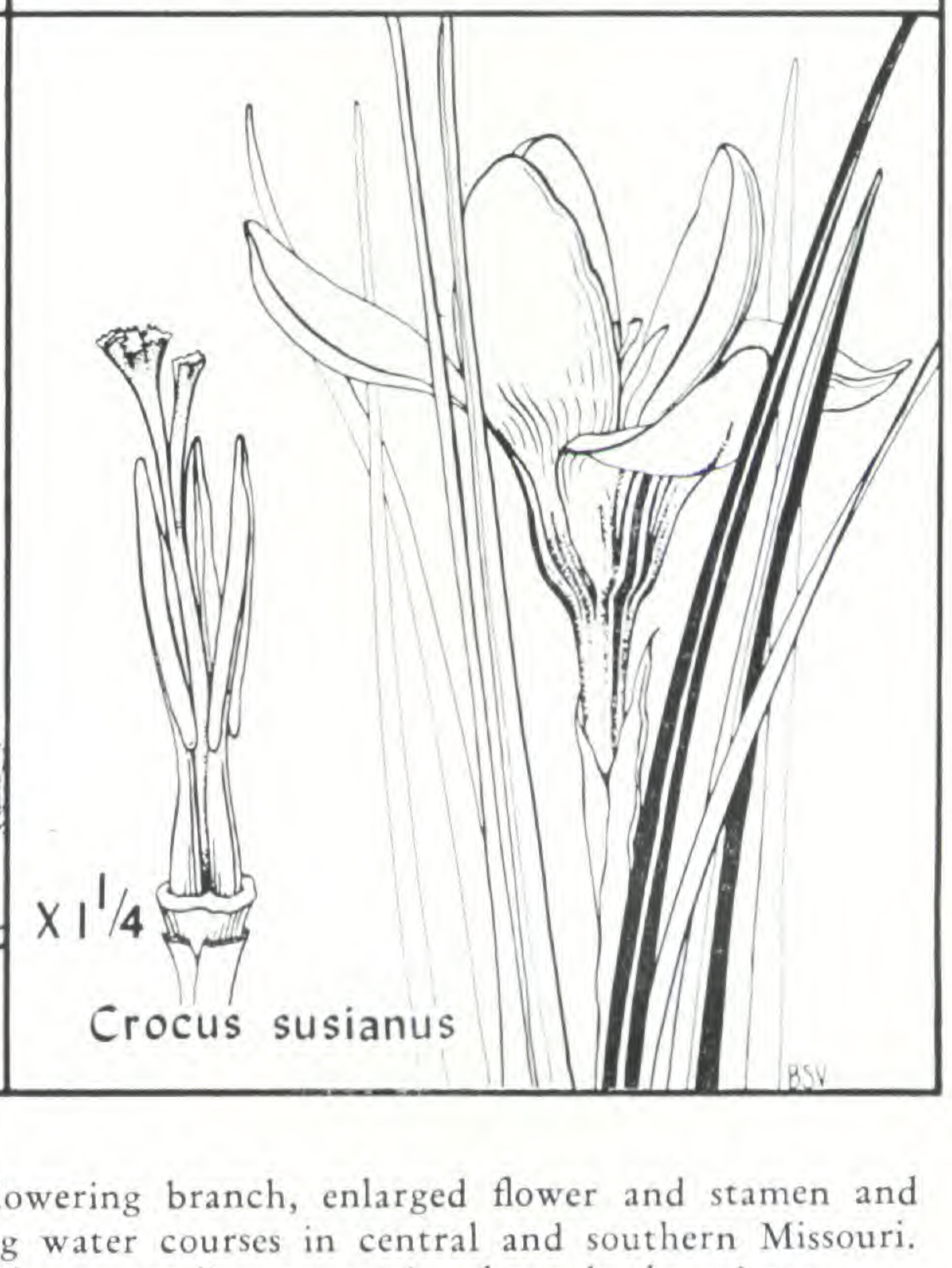
PARTS OF THE FLOWER AND THEIR NAMES
(FROM THE OUTSIDE INWARDS)

NAME OF UNIT	NAME FOR THE WHOLE CYCLE	NAMES FOR THE PARTS
Sepal	Calyx	----------
Petal	Corolla	[Tube, Limb]
Stamen	[Androecium]	Filament, Anther
Carpel	Pistil	Ovary, Style, Stigma









Hamamelis vernalis (Ozark Witch Hazel). Flowering branch, enlarged flower and stamen and staminode. Blooms from December to April along water courses in central and southern Missouri. Petals Old Gold to Chinese Red. Fragrant. Old leaves tending to persist through the winter.

Acer saccharinum (Silver Maple) X½. Male and female flowers mostly on separate trees though sometimes mingled on one branch as illustrated here. Male flower upper left. Blooms from February to early May along river banks and bottom lands throughout Missouri.

Ulmus americana (American Elm) and *Ulmus fulva* (Slippery Elm). The flowers of these two species are much more distinctive than the leaves. Those of the Slippery Elm are borne in dense clusters from large, rusty-brown, wooly buds. Blooms from March to early May in rich soil.

Crocus susianus (Crocus) *ca. natural size.* At left the three stamens and the much-branched style and stigma which are characteristic of the Iris family, to which the crocus along with Gladiolus and Blue-eyed Grass belongs.

BOOKS TO USE

Spring Flora of Missouri by Julian A. Steyermark, Missouri Botanical Garden, St. Louis, and Field Museum of Natural History, Chicago, St. Louis, 1940. Reprinted by Lucas Brothers, Publishers, Columbia, Missouri, 1954.

This is a flora of Missouri written as simply and non-technically as it is possible to write and still satisfy the demands of scientists as well as those of the general public. Line drawings in black and white illustrate nearly every native spring flower except the grasses and sedges. The cloth bound edition is out of print and it is available now only in paper back reprint.

Gray's Manual of Botany, Eighth Edition, largely rewritten and expanded by M. L. Fernald, American Book Company, New York, 1950.

Although pretty large to be called a manual, this work is one volume and can be carried in the hand. It gives concise, scientific descriptions of the native flora from Missouri eastward and northward to New England and the Maritime provinces of Canada. It is much too technical for ordinary amateurs, yet a challenge to the extraordinary, some of whom have mastered its technicalities with no outside help.

Wildflowers of Missouri, by T. C. Rickett, Missouri College of Agriculture Circular 363, Columbia, Missouri, 1937. Second edition, revised and edited by E. M. Palmquist and C. L. Kucera, Missouri Handbook Number 3. The University of Missouri, Columbia, Missouri, 1954.

Here is a wildflower guide written in clear, easily understandable language by the wife of a former professor at the University of Missouri. It is illustrated with black and white reproductions of photographs of wild flowers. The original circular proved to be very generally useful to the amateurs of the state.

The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada, by Henry A. Gleason, The New York Botanical Garden, 1952.

This is a work as technical as Gray's Manual and covering approximately the same area, consisting of three large volumes with excellent line drawings of all the native plants and a few cultivated ones which have run wild.

An annotated Catalogue of the Flowering Plants of Missouri, by Ernest J. Palmer and Julian A. Steyermark, Annals of Missouri Botanical Garden 22: 375-758, September 1935.

The entire flora of the state are catalogued in this technical book, with precise notes as to the distribution of each species, county by county. It contains a valuable discussion of the geographical distribution of plants in Missouri which should be largely intelligible to any amatuer.

Manual of Cultivated Plants, by L. H. Bailey, The MacMillan Co., New York, 1949.

If he is interested in garden plants, this fat little book will answer more of the amateurs questions about the kinds

of plants than any other. It has an unusually full index of common names. Though it is written in technical botanical style it is so clear that most amateurs are able to find their way through it. There is an unusually good glossary explaining the meaning, not only of technical terms, but of the scientific names of plants. "Scandens," for instance, means "climbing" and when we see a plant listed as *Celastrus scandens* we may immediately know that it is most probably a climbing plant. The manual is partially illustrated.

The Geography of the Ozark Highland of Missouri, by Carl O. Sauer, published for the Geographical Society of Chicago by the University of Chicago Press, Chicago, Illinois, 1920.

Professor Sauer, one of the greatest living geographers, wrote this book as a young man about his native state and those parts of it which he had known as a boy and studied as a graduate student. A combination of history, geology, and geography.

Manual of Cultivated Trees and Shrubs, 2nd edition, by Alfred Rehder, The MacMillan Company, New York, 1940.

This is a technical compendium for all the woody plants (trees, shrubs and vines) native or introduced into the temperate and sub-temperate parts of the United States. It contains technical keys and descriptions, enumerations of the outstanding varieties of woody ornamental plants and dates of introduction into cultivation; and is one of the world's finest reservoirs of useful information. It is amazing that one man should have been able to complete it in his lifetime. Every amateur should look through this book to realize (as few amateurs do) the amazingly large number of plants which have been brought into cultivation by man, and the incredible amount of information about them which has been gathered into books like this one.

SWEET PEAS, PEA PODS, AND THE PA-PIL-I-ON-A-CE-OUS LE-GU-MIN-O-SAE

If you want to understand something important and interesting about the flowers of almost any part of the world, one of the easiest ways to learn a little in a short time is with a few Sweet Pea flowers plus half a dozen pea pods from the grocery store. Plants not only are of many different species but these species are classified in groups aptly termed Families. Knowing something about plant families is the easy route to knowing something about many kinds of plants in many parts of the world. By and large, however, this is a rather technical kind of thing to know and few amateurs find their own way into the problem. If there is any route easier than the Sweet Pea-pea pod route, no one has found it yet. Not only is it an easy one but it takes you immediately into an understanding of one of the world's most important

Spring-Flowering Legumes
Native to Missouri

Amorpha (Lead Plant)
Astragalus (Ground Plum)
Baptisia (Wild Indigo)
Cercis (Redbud)
Gleditsia (Honey Locust)
Glycerrhiza (Wild Liquorice)
Gymnocladus (Kentucky Coffee Tree)
Lespedeza virginica (Bush Clover)
Oxytropis (Locoweed)
Petalostemum (Prairie Clover)
Psoralea (Psoralea)
Robinia (Black Locust)
Schrankia (Sensitive Briar)
Stylosanthes (Pencil Flower)
Tephrosia (Goat's Rue)
Vicia (Vetch)
Wisteria (Wisteria)

REDBUDS AND THE HISTORY OF THE OZARK FLORA

A perceptive naturalist, visiting southern Missouri for the first time is impressed by two things—the strange plants peculiar to the Ozarks and the strange aspect of well-known plant species. From New England to New York State to Michigan the Sugar Maples are much the same; but come to the Ozarks and you find them more variable. Here they tend to hold their leaves in the winter in a fashion unknown in the North and East. They are smaller, wartier, scragglier, more picturesque trees than other Sugar Maples. Similarly, as one comes in from the East, the Red Cedars are seen to be shorter, more variable and with larger berries, the Hepaticas and Dutchman's Breeches appear much brighter in color. The Flowering Dogwood grows in more exposed situations and has denser masses of bloom. The common red-and-yellow Columbine is a taller and more branched plant than it was back in Pennsylvania and New York; and its sepals are more greenish and frequently have a strong keel down the middle of them.

These are variations which have been studied at the Missouri Botanical Garden by the students and staff during the last thirty years. Some have been studied in great detail, as in Dr. Woodson's statistical analysis of what has been happening to the Butterfly Weeds.

We now have a fairly simple explanation for many of the disturbances of the Ozark flora. The story is most easily demonstrated for our Redbuds. One does not need to have a very sharp eye to note, as he travels westward in the early spring, that the Redbuds vary somewhat in color from one bush to another, while as one travels towards the east they become more and more uniform. From Tennessee and Kentucky to the Eastern States, Redbuds are pretty much the same kind of tree, growing in the same kind of place. When masses of them are in full bloom the interlacing flowering branches of adjacent trees cannot be distinguished by their color, or the size of the flowers, or the branching pattern of the twigs. But, drive westward out of St. Louis on Route 66 and you will see a very different kind of evidence. Even when they are all in full bloom the Redbuds are not quite the same color and some bushes are conspicuously very dark, others very light. If you stop your car and examine some of them you will find examples which are growing side by side whose flowers are so

different that you can quite easily distinguish the two, even when the branches are interlacing.

As you drive west towards Springfield, Missouri, this tendency becomes more and more conspicuous. If you know the Redbud well in the East you will be surprised to find Redbuds growing in brighter, sunnier and rockier spots than they did there; and an occasional plant will have larger and more tightly bunched blossoms than those you knew before. Many of these bushes, even when grown to blooming size, will be no taller than a man.

To find the explanation of this variation one has merely to drive on westward until he comes to the Arbuckle Mountains in central Oklahoma. Here is a hybrid swarm of Redbuds, the like of which cannot be found in any other part of the world. The Texas Redbud, a shorter, bushier tree with leathery leaves and brilliant, big flowers has hybridized for many years with the common Eastern Redbud; the Arbuckles are populated with their mongrel descendants. Flowers vary from deep pink to almost white, from large to small, from petals all of one color to diverting specimens whose upper petal will be dark pink, the side ones white and the basal pair pale pink.

If one then drives on farther West the country becomes drier and drier, the stands of Redbud fewer and farther between, the influence of the Eastern Redbud less and less discernable until it dies out altogether and one finds isolated colonies of Western Redbud. Our Ozark Redbuds owe their variability to their slightly mongrel ancestry. Some thousands of years ago at a time when the climate here was drier, the Texas Redbud spread farther up this way and there was a good deal of hybridizing. As the climate became more moist again the Texan species was at a disadvantage and finally died out; but in drier and rockier places Redbuds with a little Texan ancestry were at an advantage, particularly during spells of extreme drought such as those of the last decade.

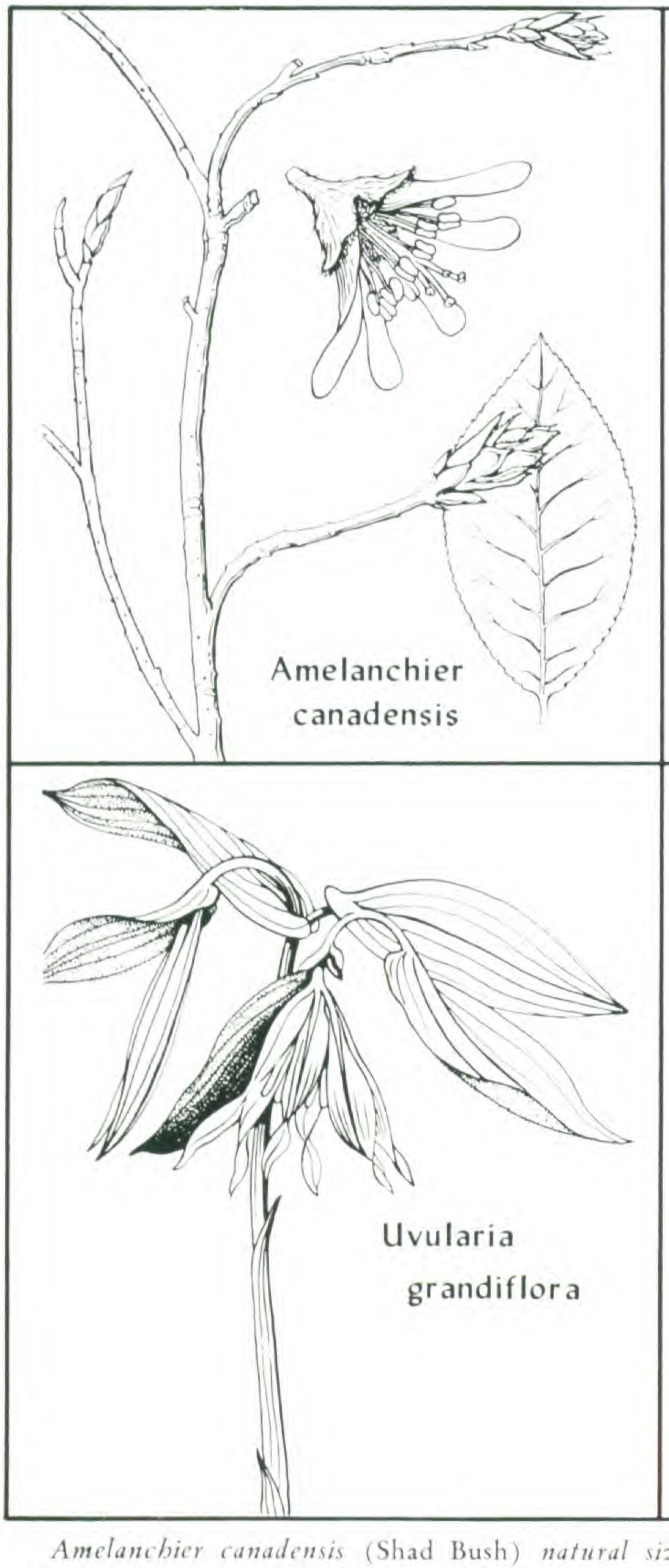
This Redbud story, which is now being studied in detail at the Garden, seems to be typical of many Ozark plants. A few thousand years ago in the Xerothermic (hot-dry) period, the climate was much drier than at present. Conditions in the Ozarks then were much like those of central Oklahoma today. At such times the Eastern Red Cedar hybridized with the Mexican Red Cedar, the common Sugar Maple with the Caddo Canyon drought-resistant maple, the Columbine with one of its south-western relatives. When better times brought back a climate not so different from that of Kentucky and Tennessee, the desert vegetation retreated but some of its mongrelized descendants lingered on. Today if one goes to the rocky, west-facing and south-facing limestone glades in the Garden's Gray Summit Arboretum he can see Redbuds, Sugar Maples, Red Cedars, and Columbines all growing together, all different from their relatives in the East, all with measureable resemblances to south-western species. If you have got to live on a dry Missouri hillside and you come from an old Eastern family, one grandfather or great grandfather from Texas is a real asset.

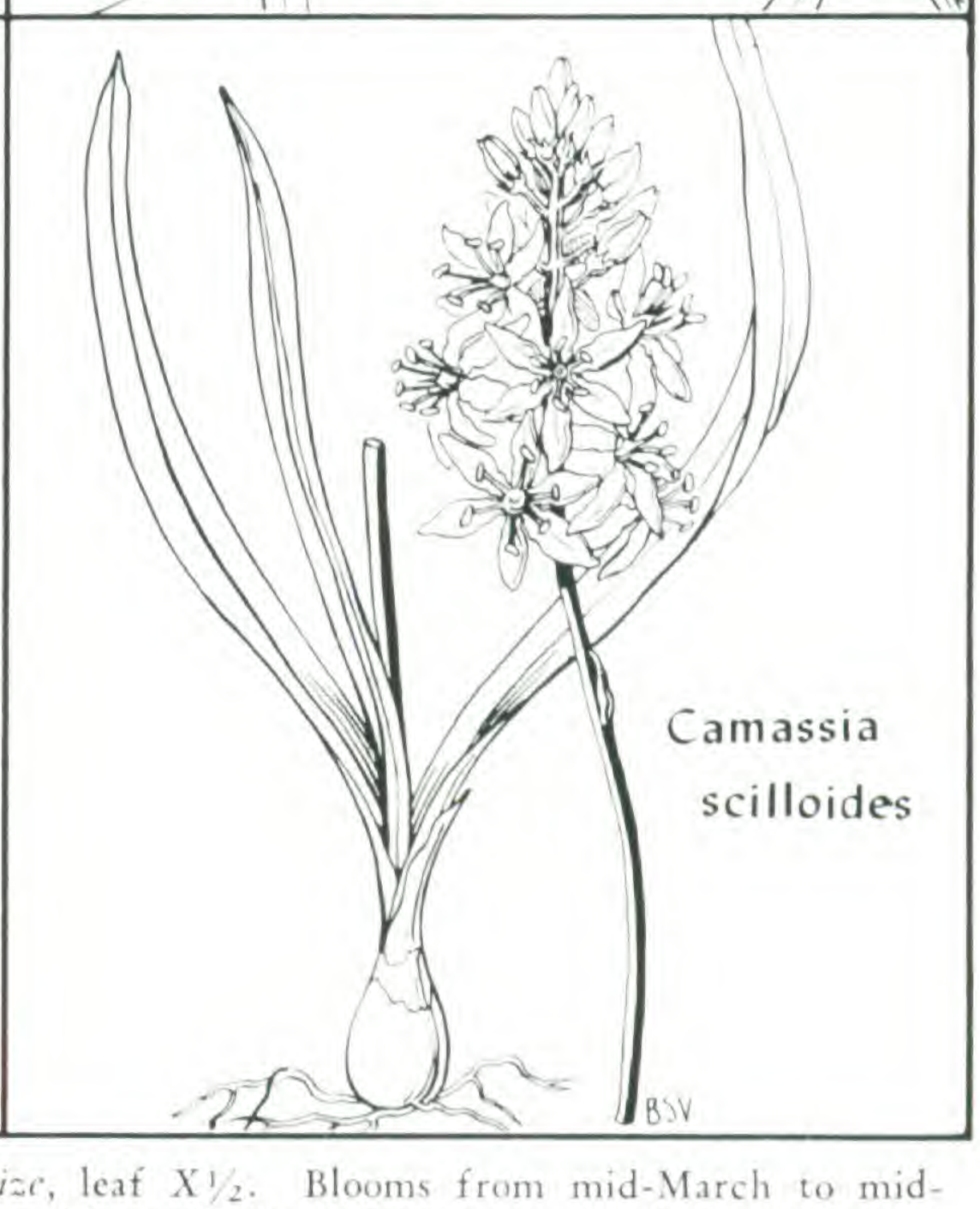
SPRING FLOWERS NATIVE TO MISSOURI

	NAME	MARCH	APRIL	MAY	JUNE
1	*Sanguinaria canadensis* (Bloodroot)	1			
2	*Amelanchier canadensis* (Shad Bush)		2		
3	*Cercis canadensis* (Redbud)		3		
4	*Dentaria laciniata* (Toothwort)		4		
5	*Dicentra Cucullaria* (Dutchman's Breeches)		5		
6	*Erigenia bulbosa* (Pepper and Salt)		6		
7	*Hepatica acutiloba* (Liver-leaf)		7		
8	*Houstonia minima* (Small Bluets)		8		
9	*Isopyrum biturnatum* (False Rue Anemone)		9		
10	*Leavenworthia uniflora* (Leavenworthia)		10		
11	*Claytonia virginica* (Spring Beauty)		11		
12	*Erythronium albidum* (White Dog-tooth Violet)		12		
13	*Erythronium mesochoreum* (Prairie Dog-tooth Violet)		13		
14	*Nothoscordum bivalve* (False Garlic)		14		
15	*Viola papilionacea* (Common Violet)		15		
16	*Viola pedata* (Bird's-foot Violet)		16		
17	*Lithospermum canescens* (Orange Puccoon)			17	
18	*Myosurus minimus* (Mousetail)			18	
19	*Polemonium reptans* (Jacob's Ladder)			19	
20	*Stylophorum diphyllum* (Celandine Poppy)			20	
21	*Uvularia grandiflora* (Bellwort)			21	
22	*Viburnum rufidulum* (Black Haw)			22	
23	*Astragalus distortus* (Bent Milk Vetch)			23	
24	*Camassia scilloides* (Wild Hyacinth)			24	
25	*Delphinium tricorne* (Dwarf Larkspur)			25	
26	*Mertensia virginica* (Bluebells)			26	
27	*Phacelia Purshii* (Miami Mist)			27	
28	*Phlox divaricata* (Blue Phlox)			28	
29	*Aquilegia canadensis* (Wild Columbine)			29	
30	*Arisaema Dracontium* (Green Dragon)			30	
31	*Arisaema triphyllum* (Jack-in-the-pulpit)			31	
32	*Dodecatheon Meadia* (Shooting Star)			32	

LISTED IN ORDER OF COMING INTO BLOOM

	NAME	APRIL	MAY	JUNE	JULY
33	*Iodanthus pinnatifidus* (Purple Rocket)	33			
34	*Viola striata* (Pale Violet)	34			
35	*Arenaria patula* (Sandwort)		35		
36	*Astragalus mexicanus* (Larger Ground Plum)		36		
37	*Clematis Fremontii* (Fremont's Leather Flower)		37		
38	*Cornus florida* (Flowering Dogwood)		38		
39	*Hydrophyllum appendiculatum* (Woollen Breeches)		39		
40	*Nemastylis acuta* (Northern Nemastylis)		40		
41	*Tradescantia virginiana* (Spiderwort)		41		
42	*Iris virginica* (Southeran Blue Flag)		42		
43	*Scutellaria parvula* (Skullcap)		43		
44	*Amsonia illustris* (Amsonia)		44		
45	*Coreopsis lanceolata* (Tickseed Coreopsis)			45	
46	*Monarda Bradburiana* (Horsemint)			46	
47	*Oenothera missouriensis* (Missouri Primrose)			47	
48	*Tradescantia canaliculata* (Spiderwort)			48	
49	*Delphinium carolinianum* (Carolina Larkspur)			49	
50	*Penstamen Digitalis* (Beard-tongue)			50	
51	*Echinacea pallida* (Cone-flower)			51	
52	*Echinacea paradoxa* (Cone-flower)			52	
53	*Saturaia glabra* (Ozark Calamint)			53	
54	*Rosa setigera* (Climbing Rose)			54	
55	*Asclepias tuberosa* (Butterfly Weed)			55	
56	*Petalostemum purbureum* (Purple Prairie Clover)			56	
57	*Ratibida pinnata* (Prairie Coneflower)			57	
58	*Vernonia altissima* (Ironweed)			58	
59	*Cephalanthus occidentalis* (Buttonbush)			59	
60	*Monarda fistulosa* (Wild Bergamont)			60	
61	*Veronicastrum virginicum* (Culver's-physic)			61	
62	*Asclepias verticillata* (Whorled Milkweed)			62	To Sept.
63	*Campsis radicans* (Trumpet Vine)			63	To Sept.
64	*Houstonia angustifolia* (Summer Bluet)			64	To Sept.



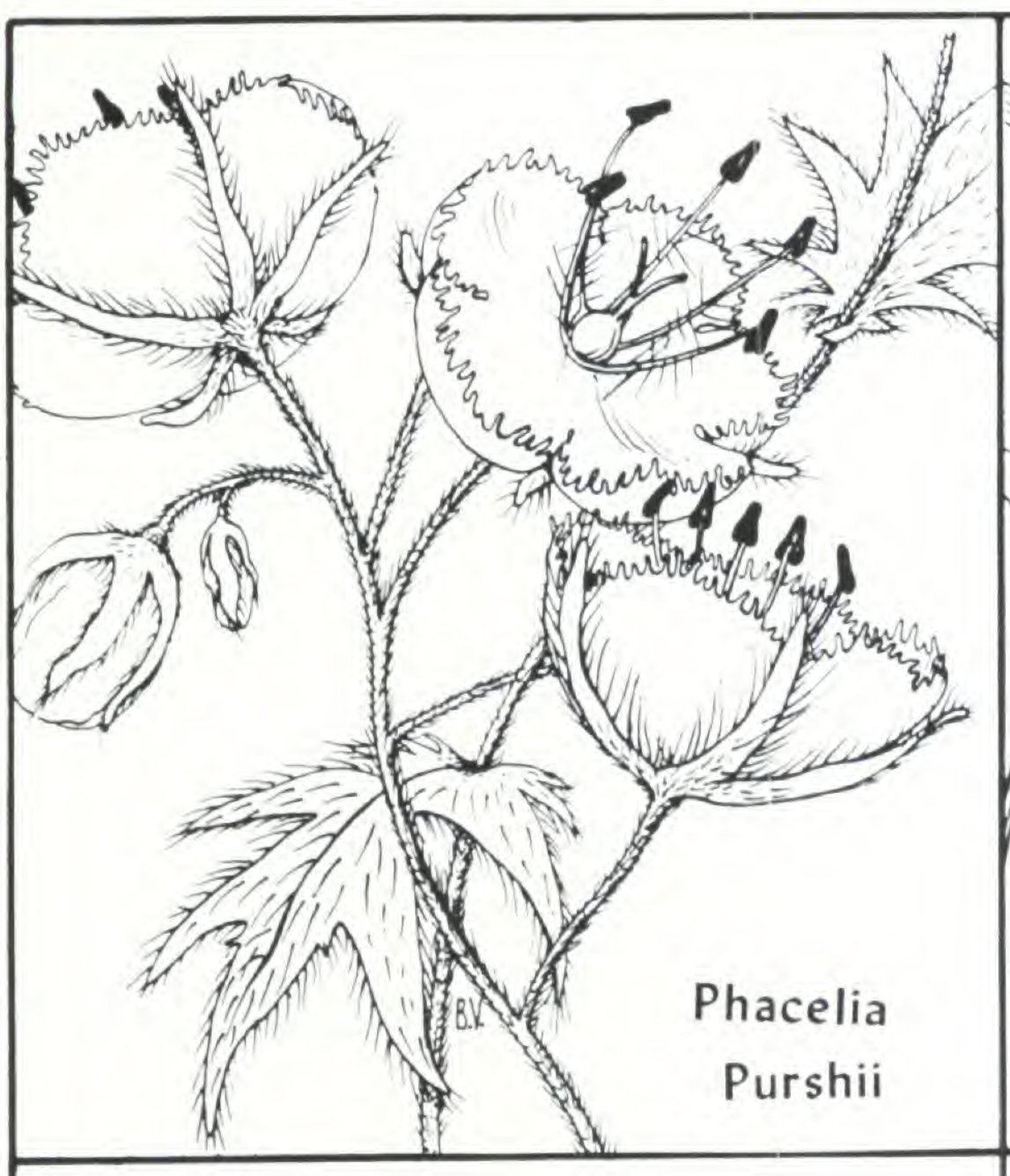


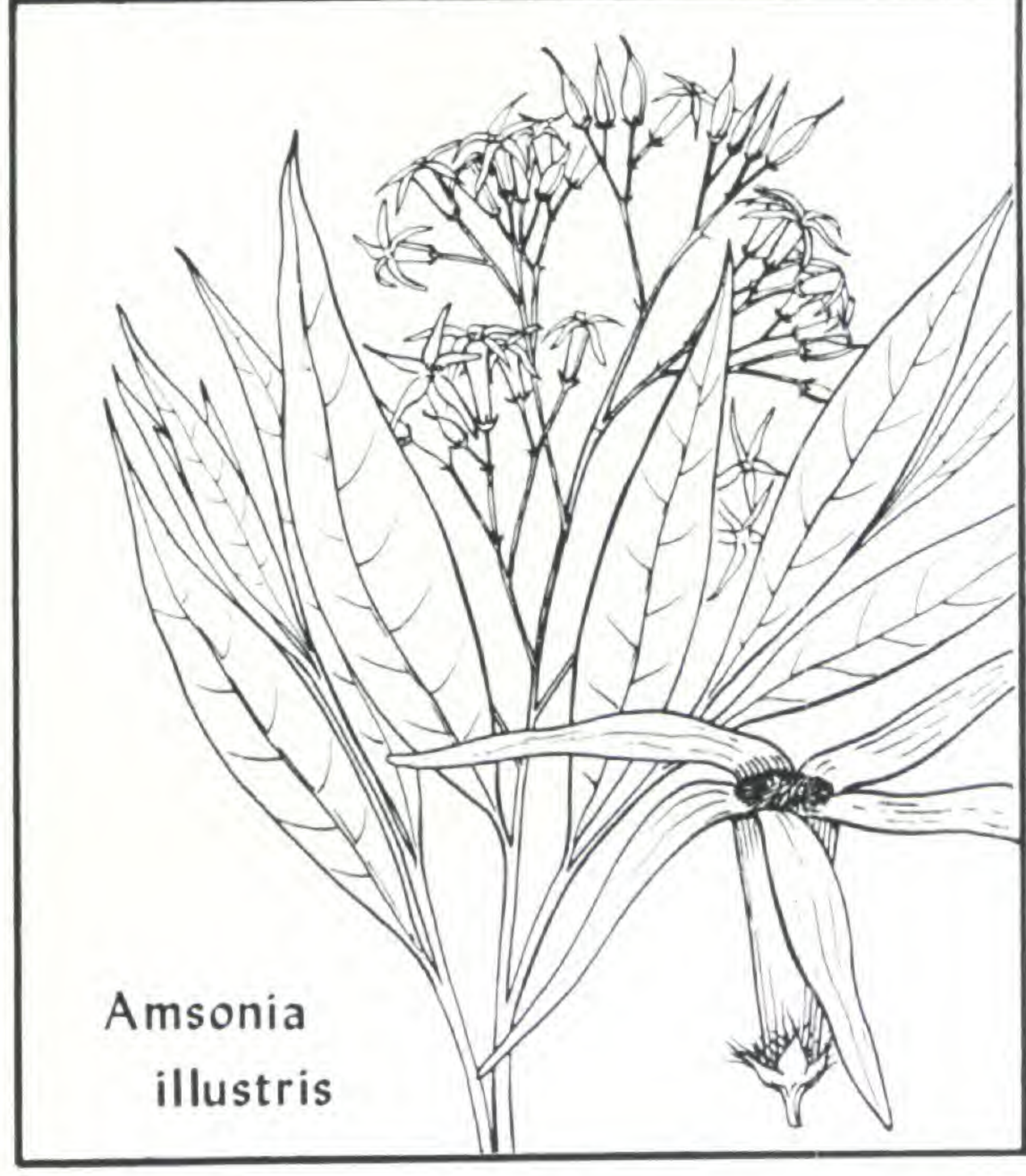
Amelanchier canadensis (Shad Bush) *natural size*, leaf *X* ½. Blooms from mid-March to mid-April in open or rocky woods and bluffs throughout Missouri; the flowers appearing before leaf buds open. At a distance it resembles wild plum, but blooms earlier in rockier places and has more graceful branches than plum.

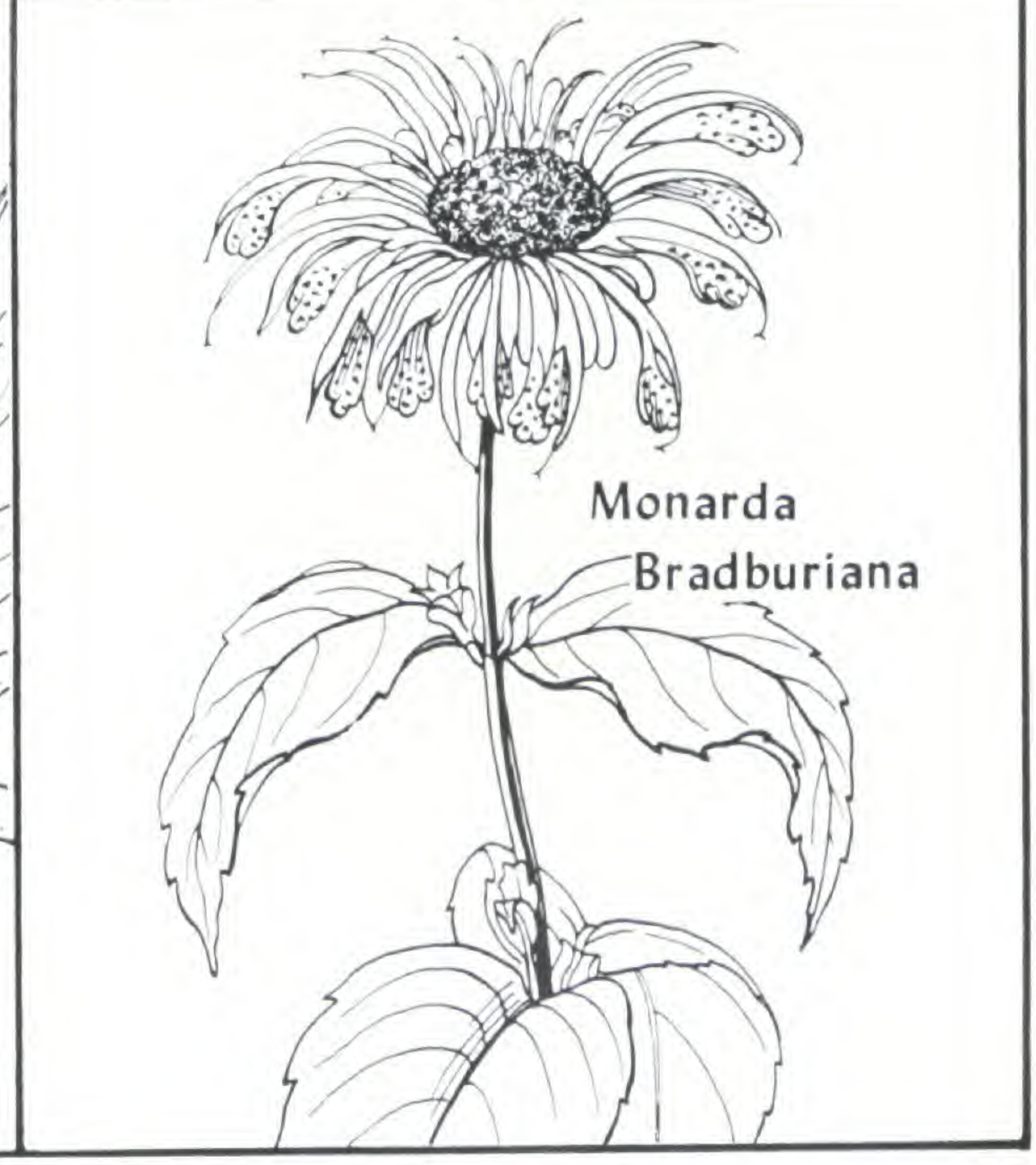
Viola pedata (Wild Pansy, Bird's-foot Violet) *ca. natural size.* The form with upper petals velvety deep purple (upper right), is commoner in the St. Louis area than the plainer form with all petals of soft gray-blue. Late-March to May in sour soils in woods, glades and prairies throughout Missouri.

Uvularia grandiflora (Bellwort) *ca. half natural size.* Flowers drooping and frequently appearing as if wilted or unopened. Sepals and petals colored alike, deep or pale yellow. Leaves very graceful. Blooms in April in rich woods on slopes of ravines or bluffs, or wooded bottom land, throughout Missouri.

Camassia scilloides (Wild Hyacinth) *ca. half natural size.* Sepals and petals colored alike, a soft, gray-blue. The slender stamens give the tall spikes an airy grace. Blooms April to May, prairies, open woods, glades and rocky open slopes, mostly on limestone in eastern, southern, and central Missouri.





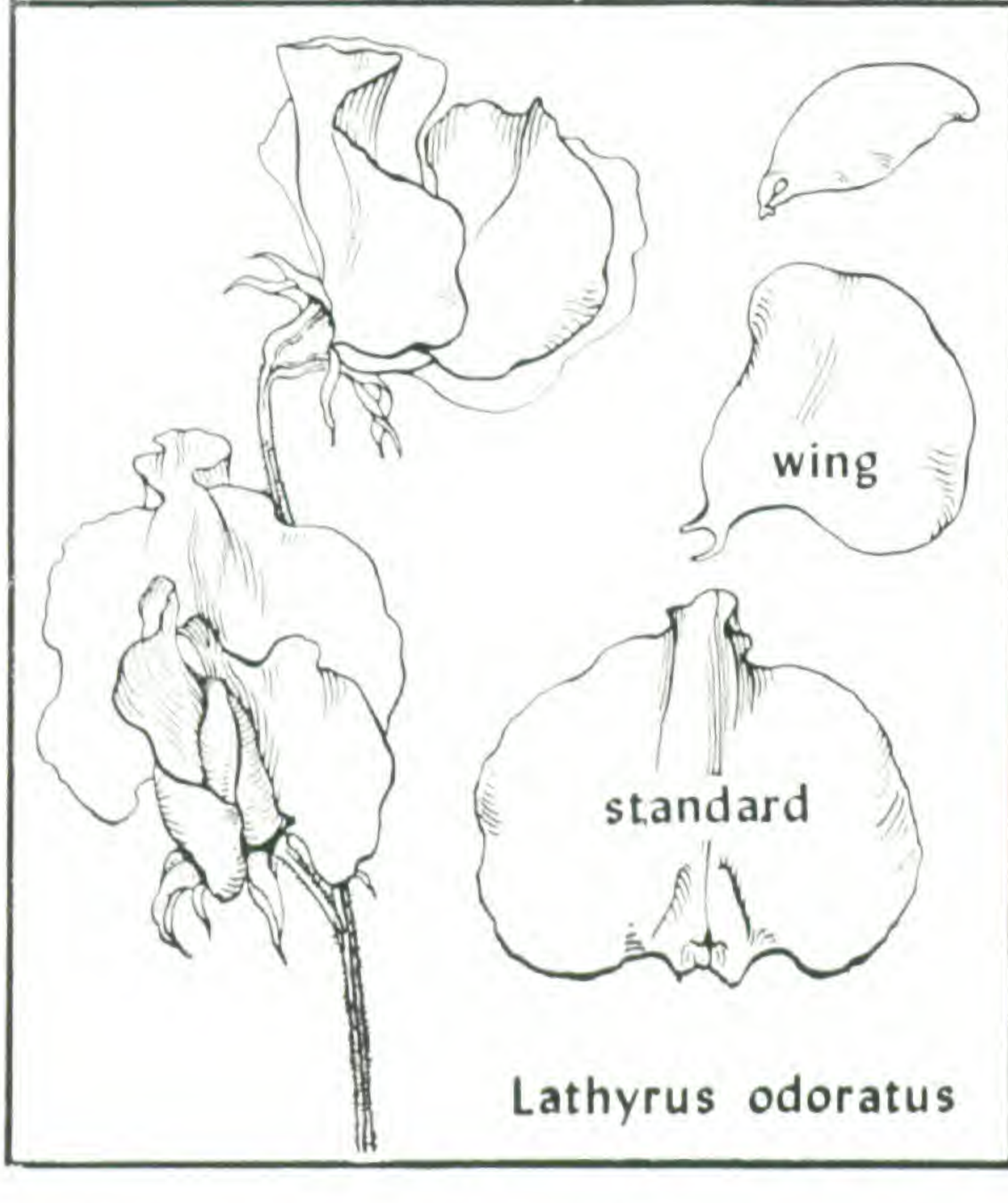


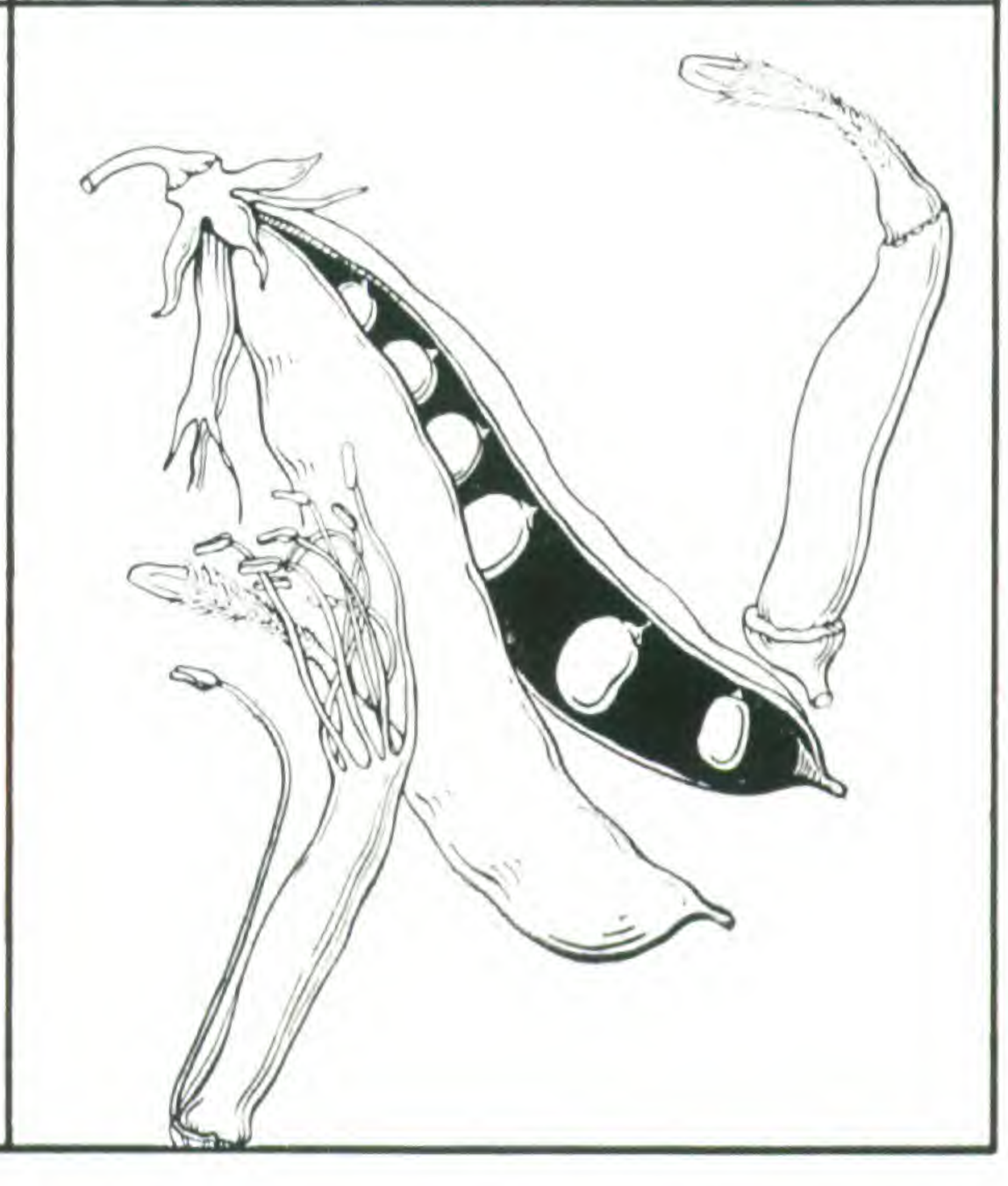
Phacelia Purshii (Miami Mist) *X2½*. Flowers soft, bluish-white, delicately fringed. The closely related *Phacelia gilioides* is darker blue and is found in rockier places from Franklin Co. westward and southward. Blooms April to mid-May in moist open woods, alluvial thickets and open places in eastern Missouri.

Dodecatheon Meadia (Shooting Star) *ca. natural size*. Flowers intense pink to white, sweet-scented. Very variable in color and color pattern in the Ozarks. Blooms April and May in prairies, glades, bluffs, and moist wooded slopes in eastern, central and southern Missouri.

Amsonia Illustris (Amsonia) *X½*, detail *X1½*. Plants form dense clumps (unlike their relatives in the East). Flowers are shades of gray-blue and white, the color of old-fashioned Canton china. Blooms mid-April to mid-June in rocky open places and gravel bars of streams in central and southern Missouri.

Monarda Bradburiana (Horsemint, Bee Balm) *X½*. The only common Bee Balm which blossoms in the spring. Flowers bright pink to almost white, attractively spotted, sweet-scented. Blooms May and early June in open rocky woods, thickets and glades in eastern, central and southern Missouri.





Oenothera missouriensis (Missouri Primrose) X⅓. Flowers opening in the late afternoon, soft primrose yellow, as large as saucers. Seed pods (lower right, X½) turn grayish as they ripen and look almost like wooden lilies when they open up. Blooms May and early June on limestone glades and rocky outcrops in central and southern Missouri.

Echinacea pallida (Cone-flower) X½. Varies in color from deep pink to almost white. Frequently grows in dense clusters of hundreds of plants. Blooms late-May and June in rocky prairies, glades and open woods throughout Missouri.

Lathyrus odoratus (Sweet Pea) X½. A typical papilionaceous legume (see page 33). Petals at right, standard below, wing in the middle, keel petal above.

Legume. Lower left: pistil of a sweet pea (greatly enlarged) showing the surrounding nine webbed stamens and one separate stamen, stigma pointed to the left. Center: pea pod X½; note webbed dried-up stamens still clinging to pod. Upper right: pistil of sweet pea with free ends of stamens cut away.

OZARK WILDFLOWERS AND OZARK LANDSCAPES

Saint Louis is not only a meeting place of different floras, it is a meeting place of quite different landscapes. The Ozarks begin just west and south of the city limits; the Glaciated Plains of northern Missouri and of Illinois fade out (technically at least) within the metropolitan area. Though the last of the great glacial advances was halted much farther north, earlier ones from the east and from the north reached our boundaries before dying out.

The Ozarks are a flat-topped low plateau of ancient limestones and sandstones whose northern border (as shown in the map on the cover) runs from St. Louis to Joplin. The Ozarks take in a small area in northeastern Oklahoma and extend across northern Arkansas where they meet the southern coastal plain, whose curving edge comes past Poplar Bluff to end at Cape Girardeau. Then the broad, flat, flood plain of the Mississippi River serves as the eastern boundary of the Ozarks to the very edge of metropolitan St. Louis. Along their southern border in Arkansas, the Ozarks are joined by the Boston Mountains, a high, flat, steep-sided mesa only recently accessible by first class roads.

The ancient limestones and sandstones of the Ozarks, lying one on top of another like a stack of gigantic dinner plates, have warped only a little in the ages since they were deposited. In only one part of Missouri, the St. Francois Mountains, have they been worn through to the ancient granites and porphyries on which they rest. These are scarely more than stumps of mountains, mostly low, whale-backed ridges a few hundred feet above the valleys from which they rise, though at least one of them, Pilot Knob, is really mountain-shaped, as if one small feature of Yellowstone National Park had accidentally been dropped down, a hundred miles south of St. Louis.

To those who were born and bred in other parts of the country, these little mountains are sometimes a blessed relief. They form soils which are so acid that at times the whole flora resembles spots in the East and North. The Southern Yellow Pine *(Pinus echinata)* is common there; Azaleas *(Rhododendron nudiflorum* var.*roseum)* fill some of the woodlands; in early spring the clear-watered streams which form granite gorges (known locally as "shut-ins") are lined with graceful bushes of Alder *(Alnus rugosa)*.

Not that the Ozarks are not fascinating country in their own strange way. They were uplifted in what was, geologically speaking, just yesterday; and the rivers, which used to meander across a flat coastal plain, now have cut down narrow steep-sided valleys leaving frequent spectacular cliffs of weathered limestone which remind one of canyons much farther westwards. Over much of the Ozarks the hills have been leached away for so long that no limestone is left along the hill tops. The soil there is full of tiny chunks of virtually insoluble chert (impure flints) which was once included in the limestone. Since chert makes a rather acid soil many of these hills have lime-loving plants at their bases and lime-hating plants along ther ridges, as over much of Jefferson county where the Blue Phlox *(Phlox*

divaricata) fills the valleys and the pink Phlox *(Phlox pilosa)* is mainly on the ridges.

Some of the limestones in the Ozarks are thin-bedded dolomites which weather into "glades". These rocky areas ooze water all winter and spring when most plants would like good drainage and turn hot and dry in the middle of the summer when plants want all the water they can get. Species which are really happy in such a situation are rare indeed and these glades have a curious flora which can at times be most spectacular. There grows the Purple Coneflowers *(Echinacea pallida)* in various shades, the Missouri Primroses *(Oenothera missouriensis)* with their pale yellow blooms as wide as bread-and-butter plates, and the summer Bluets *(Houstonia angustifolia)* so delicate that one wonders how such dainty flowers could blossom through rainless summer weeks in such exposed places.

Throughout most of the Ozarks there is so much limestone, and limestone is so soluble, that many water channels have been disolved-out deep underground. There are few brooks that have water in them all the year round but there are frequent caves and many springs, some of them really astonishing in size and beauty, where the underground brooks and rivers come to the surface.

Near St. Louis there is only one layer of rock, the St. Peter's Sandstone, which is not strongly alkaline. Along the Crystal Escarpment where this soft white sandstone comes to the surface there are many little canyons and gorges. The lack of lime, the sandy texture of the soils, and the shade of the steep-sided canyons attract another set of plants from those common in the rest of the landscape. Here one may find the Partridge Berry *(Mitchella repens)* with its evergreen leaves, tiny, pink flowers and spongy, red berries which last all winter, as well as many other rare and interesting plants. Near St. Louis the Crystal escarpment is most marked from Crystal City (where the sandstone is used for glass-making) to Pacific where imposing cliffs of it can be seen crowding up to the northern edge of the highway. North of the Missouri River it outcrops in beautiful wooded valleys near Marthasville, turning eastward to cross the Mississippi River near Winfield but not until it has produced spectacular examples of folded rock strata along highway 79.

Erigenia bulbosa. (See inside front cover).

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.

MISSOURI BOTANICAL GARDEN

Bulletin

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Contents

COVER: *Nymphaea* "Aviator Pring". About 1/6 natural size. See page 59.

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CHINESE GARDENS

BEVERLY KLING MOHLENBROCK

"A garden . . . to the Oriental . . . is any secluded spot in the earth, in the heavens or in the imagination where are garnered, cultivated and cherished certain 'flowers' or precious symbols—be they stones, or bronze, or tiles, or marble, or wood, or what not. The slightest touch of the imagination transforms and transmutes these similitudes of Nature into gardens and garlands."

A Chinese garden exemplified the harmony of the artificial with the natural—the harmony of man-made structures with natural structures. The location of every building, plant, rock, pool, and bridge was determined in terms of its blending with nature. The garden became very much like a "landscape painting in three dimensions, but like Chinese painting, it was subjective."

The Chinese learned that every possible form of rhythm was to be found in nature and made good use of this fact in their gardens, which have been called "symphon[ies] of rhythm." Disregarding their content, lines and forms were considered beautiful in themselves because of their natural rhythm. "Qualities like force, suppleness, reserved strength, exquisite tenderness, swiftness, neatness, massiveness, ruggedness, and restraint or freedom" were considered beautiful and natural in regard to lines. Similarly, qualities such as "harmony, proportion, contrast, balance, lengthiness, compactness, and sometimes even . . . slouchiness or irregularity" were considered beautiful in regard to form. Never were lines or forms straight or perfectly symmetrical, for if so, their beauty was lost.

The simplicity of the Chinese garden and its prevailing quietness were conducive to meditation and contemplation, the main purposes of a garden as established by the underlying religious philosophy. "Serenity of soul, meditation on the problems of life and conduct, contemplation of the mountains, rivers, waterfalls, trees, flowers, and stars—these were the spiritual elements that entered into the creation of a garden." A garden became an escape from reality and tension, a place where man might reach perfection through meditation. It also was a place for relaxation, a place of solitude. The builder of a garden did not intend his work of art to be used for recreational purposes, but occasionally he deviated from the main purpose of his garden and utilized it in entertaining his few choice friends. The entertainment would consist of nothing more energetic than the enjoyment of "calligraphy, painting, performing on the table lute, playing chess, writing verses, drinking wine . . . or cultivating flowers."

The philosophy created by the interwoven ideas of the two main Chinese religions, Taoism and Buddhism, was reflected in the gardens. They were built to represent the people's conception of Paradise, the design often being a replica of the semi-mythical Islands of Dawn, the Three Blessed Isles of the Eastern Sea, or of the mountains holding the Western Heaven. Heaviness and stableness were eliminated as much as possible in order to make everything appear as light and cloudlike as practicable and encourage the immortal spirits to feel at home. It was believed that by building the gardens in this manner the immortal beings, living in clouds and winds, would be pleased and would bless the garden with their presence and give immortality to the builder.

It was a Chinese belief that, by dwelling in a house situated high on a mountain, it would be possible for man to reach perfection and be swept away by the immortal beings to their heavenly abiding places on the mountain tops of Paradise. Those people who were unable to live on the mountains created them artificially in their own landscape.

Symbolism of the Chinese religions, chiefly influenced by the scholars of the Ming Dynasty (1368–1644), was applied to nearly everything in the garden. Life was symbolized by the Yin and Yang elements, the passive and active principles, the female and male forces. The Yin element was represented in "earth, water, darkness, woman, and trouble"; the Yang element was represented in "heaven, rocks and mountains, light, man, and the good." Rocks were believed to be the earthly completion of the clouds, that is, clouds in solid form, and were admired for their strange and grotesque shapes. They were gathered from lake beds, where they had been worn by the action of the water. The bent pine and budding plum trees were considered reflections of man's problems, and water was significant as the arteries of the earth. The following are some of the most important flowers and trees and what they symbolized.

Peony, wealth and honor
Peach and plum blossoms, physical charm and the loveliness of woman, as well as the spirit of the quiet, poor scholar
Orchid, culture, refinement, and nobility of character
Magnolia, associated with the idea of fragrance of virtue
Pomegranate, fruitfulness
Lotus, truth and purity
Chrysanthemum, gentility, good fellowship, and longevity
Gardenia, graceful charm
Narcissus, good fortune
Willows, grace, friendship, purity and mercy
Peach and *plum trees*, brotherliness and cordial relationships
Bamboo, fidelity, constancy, humility, wisdom, gentleness, and long life.

The Garden of the scholar and poet, which dates back to 206 B. C.–220 A. D., the period of the Han Dynasty in China, was an example of a typical Chinese Garden. Preferably located in the mountains, such gardens were occasionally found on the plains near a river. Completely surrounding the garden was a high wall, the top of which had a tile finish and a wavy appearance. In Southern China these walls were usually whitewashed, in Northern China they were built of rough stone. Similar walls were found throughout the garden and often ter-

minated as a portion of a pavilion, a hill, or a rockery. In these walls were windows, varying in design from extreme simplicity to intricate detail. A circular or octagonal gate in the form of a crescent moon, a gourd, a vase, flower petal or musical instrument led into the first courtyard of the garden. Several of these gates and courtyards were encountered before a person actually entered the garden proper.

The view through the garden gate was one of great depth, often deceptive. Through the use of concealment and suggestion, the garden was made to appear larger than it was. The entire garden could never be seen at one time, as it was divided into numerous irregular sections by winding walls, shaded corridors called promenades, and architectural structures composed mainly of wood, which merged and blended with the natural elements of the garden.

No such distinction as we know in the United States was made between the indoors and outdoors. Low-roofed buildings housed the members of the family which owned the garden. Open galleries in the form of verandas and tile-roofed pavilions, sometimes two-storied and built upon an elevated section of ground or upon stones, were located in places of vantage within the garden. Each of these galleries and pavilions was built for a specific purpose, such as to serve as a comfortable place from which to listen to the sounds of autumn—"the murmur of the leaves, the stir of homeless ghosts, the chirp of crickets, the rustling of brittle bamboo, the whirring of dragon-flies' wings," and so on—or perhaps as a place from which to view the moon as it rose over the lake, the evening sunset, the clouds in the sky, the beauty of the chrysanthemums when they were in bloom, or merely as a place where one might stop to rest and to drink some tea. The name inscribed on each of the galleries and pavilions revealed the purpose for which it was constructed. Frequently pavilions were found bordering the lake, which was a fundamental structure of the garden, or were built in the middle of the lake. A beautiful, high, arched bridge led to and from the pavilion. The curving lines of the bridge were effectively completed by their reflection in the placid water.

Paths found leading to the lake and throughout the garden added a unique touch to the beauty already established. They were constructed of very tiny grey pebbles arranged in various patterns which were outlined by thin curving stones, sometimes of a faint rose color. The color built into the Chinese garden—the red columns of the pavilions and the colored tile roofs —gave the buildings the appearance of being copied after flowers, and enabled them to "bloom" all year round. Rockery played a prominent role in the Chinese garden. Steps were constructed so as to give the impression that they were the works of Nature. Balanced rocks and rock formations containing tunnels and doorways were scattered throughout the garden, adding an unusual sight. The roughness and sharpness of this rockery was broken by the soft green hue of vines and trees, and by a brightly colored flower which would occasionally ap-

pear amidst varying shades of green.

Few lawns or open stretches of land were found in the Chinese garden, for such were considered wasteful and ugly. In contrast to Western gardens, those of China were devoted more to architecture which blended with nature than to the cultivation of lawns, trees and flowers. Nevertheless, plant life was abundant, and it served to enable the buildings to blend with nature and lose their conspicuous man-made appearance.

The main use of flowers was to decorate the interior of the Chinese homes and the courtyards. They were displayed in a series correlated with the seasons. In such a way, each season of the year was seen at its best in the numerous views of the Chinese garden.

"Competent authorities estimate the Chinese flora to contain fully 15,000 species, half of which are peculiar to the country." Of these 15,000 species, the flora that was most commonly found in a typical Chinese garden included the following:

> lotus, wisteria, laurel, begonia, jasmine, peony, iris, clematis, azalea, hydrangea, chrysanthemum, orchid, gardenia, narcissus, magnolia, pomegranate, bamboo, plum, peach, pine, juniper, cedar, willow, maple, palm, musa (banana), elm, cypress, wintersweet (perhaps *Acocanthera spectabilis*), heavenly bamboo, winter green, maidenhair tree ferns, Chinese tulip trees, and camphor trees.

The Chinese gardens can be classified into several categories. There are, of course, intermediate stages of varying degrees. The first category would include the simple house-gardens of the Chinese commoners, concentrated on utility yet revealing the beauty of nature. Small yards or miniature gardens with all the trimmings of a good-sized garden were enjoyed by people of lesser means.

The temple gardens are in a second category. Many of these were scattered throughout the Western Hills and offered beauty, peace, and seclusion to troubled minds. The Chieh T'ai Ssu, the Monastery of the Ordination, an example of one of these gardens, has been preserved due to its well-hidden location and the difficulty encountered in reaching it, even when its location is known. This garden is large, spread out, and built in a series of terraces, with the Ordination Terrace located on the summit. The Ling Yin monastery, the Spirits' Retreat, serves as another example of a preserved temple garden. Here goldfish are seen swimming in the placid pool, and awesome caves are found hollowed-out in the mountain.

A third category would be made up of the pleasure gardens of the wealthy, more elaborate in their make-up than the two previously mentioned types. During the latter part of the Sung Dynasty (960–1277 A. D.), Hangchow became the site of many of these beautiful gardens. From 1368 to 1644 A. D., the period of the Ming Dynasty, the greater number of these were centered in the vicinity of Soochow, the most beautiful and most prized being the Liu Yuan, The Lingering Garden. The Liu Yuan still exists today and is a "series of courtyards and garden rooms, dependent on each other and inseparable." Another of China's prized pleasure gardens, built in Soochow in the year 1342 A. D., was the Shih Tzu Lin, the Lion Garden. The

Shih Tzu Lin has been described as "one large rectangle around which an endless number of charming perspectives has been created." These "charming perspectives" are composed of picturesque rocks. This particular garden is the only famous Chinese rock garden which has survived.

Chinese pleasure gardens deviated from the idea of extreme simplicity in garden design, but their luxury was far surpassed by the imperial gardens, which were built by each of the imperial families after the unification of the Chinese Empire (third century B. C.). These imperial gardens combined the basic form, purpose, and philosophical symbolism of the typical Chinese garden with magnificence, extravagance, and vastness.

The elite of the Chinese gardens were clustered about the imperial garden and migrated with it as it moved from one place to another with each change of dynasties. This change was brought about directly by the Chinese people who marveled at the splendor of the imperial gardens and delighted in hearing tales of their magnificence but revolted against such luxury and extravagance when the oppression of the ruler and the heavy burden of taxation could no longer be endured. As a result of this popular uprising, a new dynasty would come into power, and it too would create magnificent gardens at the expense of the people, until once again revolt would bring another new dynasty into power. Because of this sequence of events, it can be said that "the history of China is the record of her gardens."

The imperial gardens reached their peak during the Ch'ing Dynasty (1644–1911). They were built northwest of Peiping and near the foot of the Western Hills. The largest and most splendid of all the Chinese imperial gardens was the Yüan Ming Yüan, built in 1709 by Emperor K'ang Hsi of the Ch'ing Dynasty. This fabulous garden was said to have contained literally hundreds of individual gardens, and it was distinguished from all others by its air of refinement and mist of privacy.

In addition to the basic requisites of a Chinese garden, the Yüan Ming Yüan possessed a system of canals, a multitude of buildings, and an abundance of plant life. The canals divided it in such a way as to create numerous islands and valleys. These canals were reported to appear as works of nature rather than works of human beings. They were irregular in width and wound gracefully between the hills. The rocks which lined the canals were of various sizes, shapes, and designs and added to the desired natural effect of the structure. The buildings included the "dwellings of the numerous members of the Emperor's large family, . . . halls for audience and for meeting officials, an ancestral shrine, temples, libraries, theatres, farm buildings, . . . a drill field for archery contests, a workshop for the artists, boathouses, . . . numerous pavilions and covered porches of various shapes and sizes." These buildings, which were located on the many islands of the garden, were connected by a network of courtyards, covered passageways, and bridges. Waterfowl swam on the lakes of the garden, and fish of gold,

silver, and copper lived in the pools. In addition to the plants commonly found in Chinese gardens, the Yüan Ming Yüan was graced with the beauty of lilies, wu t'ung trees *(Sterculia platanifolia)*, reeds, and apricot trees, as well as rice and grain fields.

The combination of all the splendors of the Yüan Ming Yüan attracted, among others, Jesuit missionaries who, in the seventeenth century, aroused European interest in Chinese gardens by describing them in their letters. As a result of this interest which increased rapidly in the eighteenth century, Europe's very stiff and formal style of gardening gave way to a style greatly influenced by China. The first person to introduce the Chinese gardens into Europe was Sir William Chambers, who, in 1750–1757, built the first Chinese garden in England. The new Chinese-English garden style was gradually carried into France, Germany, and other parts of Europe.

During the early and middle nineteenth century, the power and influence of the Ch'ing Dynasty were declining, but China haughtily continued to claim universal authority. Her attitude and policy of resistance to foreign demands for trade concessions in China resulted in the French and British campaign of 1860 against her. This campaign led to the evacuation and doom of Yüan Ming Yüan. British and French soldiers looted all the treasures possible from this imperial garden, and the objects which were too large to be taken were broken and widely strewn. The remainder was destroyed by small fires started by the soldiers.

Finally a truce was made among the belligerents, and it seemed as though peace was to be restored; that is, until the Chinese were discovered treating the French and British prisoners cruelly under the flag of truce. Upon receipt of this knowledge, Britain sent Sir John Michel and his forces to burn the Yüan Ming Yüan as revenge for the ill treatment afforded the war prisoners. These troops carried out their orders well and went so far as to burn adjacent gardens and those miles away.

The destruction of the treasures of art and literature of the Yüan Ming Yüan was total, but a few of the architectural structures remained standing. In 1873 a few minor repairs were made on the remnants of the garden, but it was kept closed. In 1900 once again the palace garden was raided, and after that the Yüan Ming Yüan ceased to exist. Its annihilation has been an irreplaceable loss, not only to the Emperor and the people of China, but to all cultured peoples of the world.

The dramatic end of the Yüan Ming Yüan signified the end of a glorious empire, the remains of which today are seen faintly in the New Summer Palace, outside Peiping, which was built just after the destruction of Yüan Ming Yüan in the campaign of 1860. The payment of a gate fee enables a person to visit these palace grounds today.

In northern China the Sea Palaces also represent what was at one time the romantic atmosphere of the long vanished imperial gardens. Most of this

atmosphere has been lost, due to the fact that the Sea Palaces have been converted into recreational areas, open to the public. Such innovations as these are absolutely incompatible with the original Chinese concepts of a garden.

The sites of many of the old Chinese palace gardens are now occupied by modern institutions, such as Tsing Hua University, Yenching University, military garrisons, flying fields, an orphanage, a trade school, hotel, hospital, and numerous summer cottages.

Although many of the beautiful Chinese gardens have been destroyed by wars, the influence of the basic simplicity, fundamental purpose, and philosophical symbolism of the Chinese gardens has enabled us to realize that a garden is an art to be enjoyed by all —the people of great wealth as well as the people with only small areas of land "lying just beyond their windows."

THE GARDENS OF CHINA EXISTING TODAY

Hangchow—The Gem Spring of the Dancing Fish, Yu Ts'uan; The Island of the Three Pools of the Moon's Reflection; The Monastery of Pure Compassion, Chin Tz'u Szu; The Monastery of Secluded Light, T'ao Kuang; The Pavilion from Which the Storks Went Forth; Pavilion of the Lake's Heart; The Spirits' Retreat, Ling Yin . . . ; The Upper Monastery of India, Shang T'ien Chu; The Villa of the Liu Family.

Nanking—Only a few fragments remain.

Peking—The Black Dragon Pool, Hei Lung Tang; The Forbidden City; The Garden of Smiling Harmony . . . Summer Palace; many Private Gardens that must be visited by means of letters of introduction; Monastery of the Ordination, Chieh T'ai Ssu; The Peony Gardens of Tung Hsiao Ssu; Tan Che Ssu; The Temple of the Azure Cloud, Pi Yun Ssu; Wo Fu Ssu.

Shanghai—Chang Yuan; Pang Sung Yuan; The Willow Pattern Bridge (undoubtedly the central portion of a Chinese garden); Yu Yuan.

Soochow—The Autumn Garden, He Yuan; The Forest of Lions, Shih Tze Lin; Garden of the Anhuei Guild, Hui Yin Yuan; The Lingering Garden, Liu Yuan; The Returned Garden, Fu Yuan; The West Garden of the Hsu Family . . . , Si Yuan; Yi Yuan, on the site of a Ming garden.

Yangchow—Hsiao Chin Shan; Ping Shan T'ang.

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BOOK REVIEW

African Violets, Gloxinias and their relatives: a guide to the cultivated Gesneriads. By Harold E. Moore, Jr. Illustrated by Marion Ruff Sheehan. 323 pp., 5 colored plates, 50 line drawings. The Macmillan Co., New York, 1957. Price $10.00.

HERE is a book long needed to straighten out the Gesneriaceae family.

Part I has chapters telling where the Gesneriads grow in nature; and how to handle them under culture—their propagation, pests, diseases and remedies.

Part II deals with the kinds of Gesneriads, of which over 100 are listed, and includes a key to the cultivated genera. There are five color plates and more than 40 line drawings illustrating nearly every species described, which will help the grower to identify his plants.

A guide to pronunciation, the meaning of names and a glossary rounds out a well written book.

Although written more for the student of the Gesneriaceae, it is of more than passing interest to those who grow African Violets, Gloxinias and a few other members of this family.

—Armyn Spies

HIBISCUS FOR ST. LOUIS GARDENS

E. L. EVINGER

MENTION the name Hibiscus in garden circles and you will find your listeners will have a wide and quite divergent idea of the species of flower to which you refer. Much of this confusion is due to the fact that many varieties of *Hibiscus syriacus* (the most common species grown in the St. Louis area) are known popularly as "Shrubby Altheas" thus they are thought to be in the genus Althea to which the Hollyhock, another member of the Mallow family, belongs. More properly *Hibiscus syriacus* is known as the "Rose of Sharon." Few other species are well-known locally.

The Mallow family (the Malvaceae), to which Hibiscus belongs, consists of some thirty-nine genera and from eight to nine hundred species distributed over the entire world, with the exception of the Arctic region. Tropical America has the largest number of species growing most abundantly. There are relatively few members of the family with any commercial value or importance; of these few, the best-known are Cotton (*Gossypium* spp.) and Okra (*Hibiscus esculentus*). The Mallows all contain a mucilaginous substance, at one time used in making confection, and the source of the name "Marshmallow." Such species as *Hibiscus cannabinus* of the Old World tropics contain a fibre used in making a sort of jute called Indian Hemp or Bastard jute.

The ornamental Mallows of prominence, in addition to the Rose of Sharon, are the herbaceous, biennial

Hibiscus syriacus "Coelestis"

Hollyhock (*Althea rosea*) and the Swamp Rose-Mallow (*Hibiscus moscheutos*); other new and exciting varieties of such species as the Rose of China (*Hibiscus rosa-sinensis*) must be kept in the greenhouse or be protected during winter.

Members of the Mallow family are herbs, shrubs, or trees, with alternate, simple, and mostly palmately veined or lobed leaves. The open, bell-shaped flowers are regular and bisexual, with five sepals, five petals and numerous stamens. The family is characterized by the fusion of the many stamens into a tube which is often also fused at the base with the petals and which encloses the ovary and style, the many anthers branching off from the surface of the tube at various levels.

An old name of unknown Greek or Latin origin, HIBISCUS *is now applied to those Mallows whose seeds are borne in a five-celled capsule* that is dry or

more or less dehiscent (splitting regularly), thus distinguishing Hibiscus from the genus ALTHEA, *whose seeds are borne in a whorl or disc.* The flowers, often large and showy, are scarlet, pink, white, yellow or combinations of these colors. The calyx is five-toothed or parted and the bracts or bracteoles at the base of the flower or pannicle may be few to many and broad or narrow. Anthers are borne over much of the length of the staminal column. The pistil (most of which can be seen only by slitting the staminal column) has a style divided at the tip into five distinct slender and spreading branches, and the ovary is made up of many united carpels which form the capsule fruit. Seeds are kidney or bean-shaped and few to many in each of the five cells.

Hibiscus or Rose-Mallow is a varied genus, with species widely distributed in the temperate and tropical countries. It is made up of herbs, shrubs, or even small trees. There are between one hundred fifty and two hundred species, of which about seven (with several varieties) are adaptable or have promise for use in St. Louis gardens. They are most suitable for border plants or occasionally as accent groups.

Hibiscus militaris Cav. This species is an herbaceous perennial, growing four to six feet high. The leaves are glabrous or nearly so, dark green, rather small, hastate (with two short lobes at the base), the middle lobe ovate-lanceolate or triangular-lanceolate, long-acuminate and equally crenate toothed; the upper leaves are halberd formed (these spear-shaped leaves give the plant a military appearance, hence the name militaris). The bracts or bracteoles are linear or awl-shaped and nearly or quite half as long as the calyx. The flowers are three to five inches across, white, bluish or pale rose with a purple eye. The fruit is enclosed in an inflated calyx; the seeds are hairy or fuzzy.

This is a hardy, fine species for use in wet places. No selections or variations yet named are in the trade.

Hibiscus coccinius Walt. This is a perennial herbaceous species that grows from three to ten feet high and is known for its large rose-red or crimson flowers that are five to six inches across and borne in the upper leaf axils. The leaves are digitately or somewhat pedately three- to five-parted, the divisions slender, acuminate and remotely toothed. The bracts or bracteoles are very narrow and mostly bristle-shaped, about one inch long, and shorter than the large ovate-lanceolate pointed calyx lobes. The petals are obovate and much narrowed at the base so that they stand well apart. The staminal column with the enclosed style is very long. Fruit capsule is ovoid and about an inch long.

This species is of doubtful hardiness in the St. Louis region, which is the northernmost limit of its natural range; it may need to be carried through the winter in a cellar or cold-frame. Further investigation may find strains of hardy character for general local use.

Hisbiscus lasiocarpus Cav. This plant is a perennial herb, growing to six feet. It has pubescent stems and leaves, the leaves are ovate to more or less cordate and are slightly three-lobed. The bracteoles are angular and

bristly. The flowers are white or pale rose with a darker center. This species is a native of the swamps from Kentucky westward and south. It is slightly out of range in this region and of no special interest.

Hibiscus moscheutos Linn. (*H. palustris* Linn.) This is the Swamp Rose-Mallow, a vigorous-growing, perennial herb reaching eight feet or more. The stems are hairy or even woolly, the leaves which are mostly ovate and entire, though sometimes three lobed at the tip, are crenate-toothed and very soft-woolly becoming nearly or quite glabrous on upper surface. The bracts or bracteoles are linear, nearly or quite as long as the woolly, triangular-ovate calyx. Flowers of the Swamp Rose-Mallow are very large, from four to even eight inches across, and are light rose color in the native form. The fruit capsule is globose-ovoid and glabrous.

Naturally occurring in marshes, the Swamp Rose-Mallow is native along the east coast from Massachusetts to Florida and westward to Lake Michigan. It can be easily adapted to garden culture, since it does well in wet or poorly drained spots and thrives in any good garden soil. This is one of the best and easiest to cultivate of the Rose-Mallows; it needs only to be cut back during the dormant season. The foliage is sturdy and effective and the plant blooms in August and September.

The Swamp Rose-Mallow is the most generally cultivated of the hardy herbaceous perennial types of Mallows. Soon after the turn of the century several varieties of this species appeared some of which may yet be found in old gardens. They were, however, not constant; and obtaining a good strain seemed a matter of chance. The only propagation was from crown divisions —a long and slow process and not very practical or widely used. Named varieties now appearing commercially include: "Anne J. Hemming," bright red; "Crimson Eye Rose-Mallow," white with red eye; "Clown," white with pink veins; "Crimson Wonder," bright vermilion red; "Fresno," silvery pink, giant size; "Satan," deep dark crimson; "Poinsettia," bright scarlet; "Avalon," blush-pink to red. There is also a grafted form named "Rainbow Rose of Sharon" now offered on the market which has branches bearing white, red, and blue flowers, separately, on the same bush.

Hibiscus oculiroscus But. Crimson Eye Rose-Mallow. This species is often classified as a variety or form of *H. moscheutos*, from which it differs only by having white flowers with crimson centers; and in fact it may be the variety referred to by this name above.

Hibiscus incanus Wendl. This species also is much like *H. Moscheutos* and sometimes passes for it in the trade. The leaves are smaller and narrower, ovate-lanceolate, rarely lobed, and serrate-toothed. The flowers are sulphur-yellow, pink or white with a crimson eye. This species seems to be hardy in our region but may need the protection of a heavy mulch in winter.

Hibiscus syriacus Linn. The Rose of Sharon or Shrubby Althea. For local gardens this species and its varieties are the most interesting and most promising of the Hibiscus. The Rose of Sharon is a shrub six to twelve feet

high, sometimes almost tree-like, much branched and nearly or quite glabrous. The leaves are rather small, short-petioled, three ribbed and triangular or rhombic-ovate. The lower leaves are mostly three-lobed with many rounded teeth or notches. The bracteoles are linear, six or seven in number and shorter than the sepals. The flowers, solitary in the axils on the young wood, are short-peduncled, somewhat bell-shaped and two or three inches in width and length. The petals are rose or purple, usually darker at the base in the original species.

The exact origin of the Rose of Sharon is not known. It was introduced into Western Europe before 1600, probably from India or the Eastern Mediterranean region. It is now one of the most common ornamental shrubs and is quite hardy in this area. A feature of old fashioned gardens from colonial times, it seemed for a while to have lost favor to other flowering shrubs, but is now coming into its own again largely due to the habit of free-flowering in late summer after other shrubs have passed their peak of bloom. Also new varieties are showing great promise and may, in time, rival these of the already famous tropical species and varieties of Hibiscus. Its culture is easy if it is given a little protection from sudden freezing and thawing. This can be done by placing the plant away from an extreme northern exposure and by mulching. Little pruning is required.

Listed below are the old and some of the new improved varieties of Rose of Sharon now being offered. They differ from one another largely in the size and color of the flowers and by the leaf varigations. (Asterisk indicates plants which may be seen growing in a Hibiscus planting in the knolls in the Missouri Botanical Garden, although some of the varieties are yet quite small and cannot be observed in flower this season.)

"Anemone flora", flowers double pink
"Ardens"*, flowers double violet or purple
"Admiral Dewey", pure white double
"Banner", bluish, double
"Boule de Feu"*
"Celestial Blue"*, light blue
"Coelestis"*, purplish blue
"Crimson wonder", deep, dark red or crimson
"Flora plena", double white
"Foliavarigata"*, variegated leaves
"Grandiflorus superbus", large pink
"Jean de Arc"*, double white
"Hamabo", pale bluish with large carmen blotch at the base of petal
"Lady Stanley", white-shaded rose, double
"Lucy"*, double bright red
"Monstrosus", double red
"Paenoflorum"*, double pink
"Pulcherima"*, pink and white
"Purpurea semiplena"*, double purple or bluish
"Rosea", white crimson eye
"Rubis", red
"W. R. Smith"*, pure white
"Speciosa plena", double, pinkish-striped or blotched with deep rose
"Totus albus"*, pure white
"Woodbridge"*, clear rose-pink to red
"White red-eye"*, white with red center.

RESEARCH IN BREEDING TROPICAL WATER LILIES

GEORGE H. PRING

THE successful introduction of the yellow day-blooming tropical water lily, *Nymphaea Burttii* (Annals of the Missouri Botanical Garden, Vol. 20, 1933), opened up an entirely new field in water lily breeding for the writer. *Nymphaea Burttii* was introduced into cultivation by the Garden in 1929 from seeds sent by Mr. B. D. Burtt, botanist for the Tsetse Research Bureau, Kondoa, Tanganyika. Several hybrids, derived from Burttii, have been introduced into the commercial trade and amateur collections. These include: "Saint Louis," 1932; "Yellow Star," 1932; "African Gold," 1941; and "Sunbeam," 1941. The latter is a viviparous type, producing young plants from the center of the fully developed leaves.

The parent species, *N. Burttii*, unfortunately is a very poor propagator from tubers; although tubers are formed they fail to grow into young plants. This defect did not show up in the first generation hybrid, "Saint Louis"; but it definitely did in the later hybrids produced from it.

To obtain a hybrid with a deeper yellow, the good propagator, *N.* "Saint Louis," was selected to back-cross to *N. Burttii*. The result was an excellent dark-yellow hybrid, named *N.* "African Gold," which was, however, a poor propagator from tubers and was also sterile. The commercial growers were disappointed in the poor reproductive qualities inherited from the parent *N. Burttii*, and hoped that future research would produce a good, dark yellow which they could propagate annually. From the amateurs the request was: "You have originated many large hybrid water lilies in varied colors suitable for large pools. Why don't you develop small water lilies to fit our small pools?"

I accepted the challenge and visited the Kew herbarium in England the following year, 1948, to search through the water lily collections. Tropical pygmy water lilies had not been introduced into cultivation; however, two perfect specimens (*Nymphaea sulfurea*, yellow; and *N. Heudelotii*, white-shaded, pale blue), were found and studied. Both of these species presented the opportunity for research in breeding smaller water lilies. Dr. H. S. Conard, an authority on water lilies, writing of the tender day-blooming kinds, states:

"There are two treasures awaiting introduction and which promise great things. Africa hides in its vast interior two yellow tender species allied to the present blues and whites. One has excellent double flowers six or seven inches across—*Nymphaea Stuhlmannii*. The other, *Nymphaea sulphurea*, is a pigmy with flowers and leaves two to three inches in diameter. Aside from their individual attraction, think what a future they offer for hybridization! It is earnestly hoped that they will not long be absent in our gardens."

Twenty-five years later on August 30, 1949, through the efforts of Mr. Robert Trickett of Kew, a tuber of *N. sulfurea* collected by Mr. P. J. Greenway in Northern Rhodesia, was re-

ceived at the Garden. Despite its dehydrated condition upon arrival, the tuber was successfully grown in a half-barrel and it flowered the summer of 1950. On February 7, 1950, seeds of *N. Heudelotii* collected by Mr. R. D. Meikle of Kew Gardens while on a visit to Nigeria, arrived from Mr. Trickett. Upon arrival the seeds were immediately sown in pans and placed in the propagating tanks in the greenhouse. Excellent germination soon appeared, the first flowering plant being grown in a half-barrel. To increase the stock, self pollinations were made the first season for seed production. Again the Garden is credited with being the first to introduce new species of Nymphaea into cultivation (Missouri Botanical Garden Bulletin, 1951).

Experience has proved that the breeder of water lilies is limited to intercrossing within sub-groups of the Nymphaceae; for example, the hardy pygmy water lilies, *N. tetragona* (white), and the hybrids "helvola" (yellow), and "Jo-Ann Pring" (pink), belong to the Castalia group which are not compatible with the recently introduced pygmies of the Brachyceras group. To produce new tropical pygmy water lilies in varied colors will necessitate a long-range breeding program, since only large-flowering types are available for pollination with the tropical pygmies.

During August 1951 the writer started pollinations between *N. Heudelotii* and *N. colorata* which resulted in a medium-sized, pale blue hybrid named "Bluet." It is a very poor propagator that is almost sterile and consequently of botanical interest only. *N. sulfurea* crossed with *N.* "African Gold" produced a medium-sized dark yellow hybrid, *N.* "Saint Louis Gold," with all the floral characters of *N. sulfurea.* With several seasons testing it has proved to be a desirable hybrid for small pools and is as well a free-flowering lily during the early spring in the greenhouse, particularly in small pots. *N.* "Saint Louis Gold" is now listed in the commercial catalogs as suitable for small pools.

A cross between *N. sulfurea* and *N.* "Saint Louis" has produced a yellow hybrid which satisfies the connoisseur and is now in the trade catalogs for distribution. It is named in memory of Lt. R. Bradford Pring, a pilot in World War II. It possesses hybrid vigor, is an excellent propagator from bulbs (a characteristic from its ancestor, *N.* "Saint Louis"), and it is viviparous and very fertile. *N. sulfurea* has influenced both its color and fertility. *N.* "Aviator Pring" is a very good indoor winter-flowering hybrid.

Frequently amateurs will ask how long it will take before a new lily is originated and distributed. For example, in the production of "Aviator Pring" and "Saint Louis Gold" the pollinations for the crosses were made in August 1952. The hybrids flowered the following year. Both hybrids were distributed for sale in 1957. The intervening period was necessary for a series of tests to ascertain the abilities of reproduction from tubers and for the production of sufficient stock for distribution. Hybrids that are viviparous producing piggy-back plants are assured of speedy reproduction.

× NYMPHAEA "AVIATOR PRING" (BRACHYCERAS), PRING

N. capensis zanzibariensis f. *rosea* ♀ — *N. capensis zanzibariensis* f. *rosea* ♂

N. capensis zanzibariensis cv. castaliiflora ♂ — *N. ovalifolia* ♀

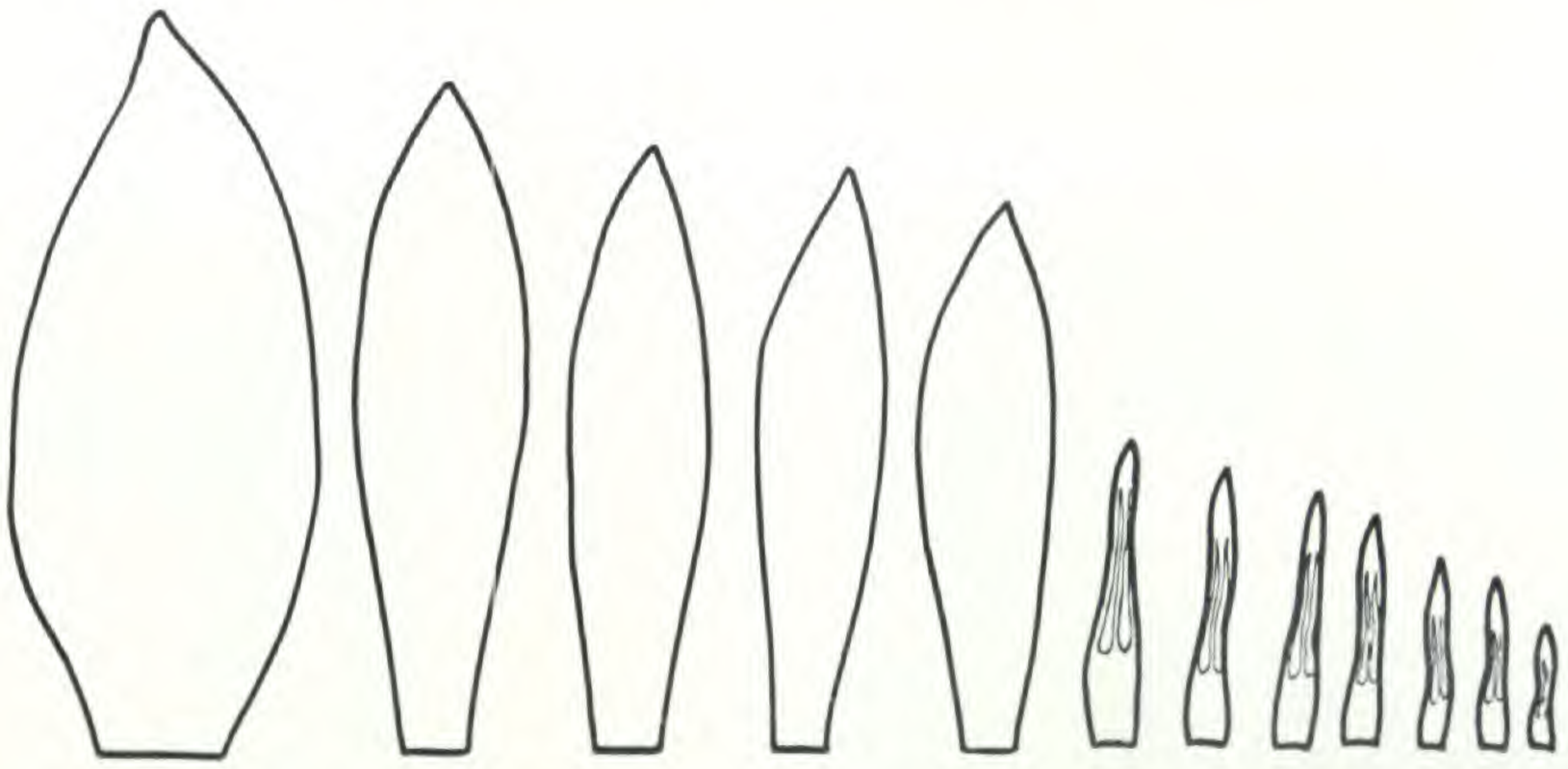
N. ovalifolia ♀ — *N.* "Mrs. Edwards Whitaker" ♂

N. "Mrs. George H. Pring" ♀ — *N. Burttii* ♂

N. sulfurea ♀ — *N.* "St. Louis" ♂

N. "Aviator Pring"

Hybrid vigor is shown up in this new primrose yellow hybrid. This is the first yellow variety that meets all the requirements of the grower. It is a good propagator and is occasionally viviparous. This variety has exceeded all expectations regarding size of a flower.



Nymphaea "Aviator Pring". About ⅓ natural size. (See Cover.)

Description—Flowers 9-10 inches across; bud narrowly ovoid, pale green; peduncle brown; sepals 4, ovate-oblong, hooded at the apex, 2 inches wide, 5 inches long, outer surface pale green, primrose yellow within; petals 40–42, primrose yellow, 4 rows, outermost row lanceolate, obtuse, 4½ inches long, 1 inch wide, occasionally suffused with green as in the sepals; stamens 265–270, 7 rows, outermost row 2 inches long, 5/16 inches at the spatulate base, pale yellow at the apex, golden yellow toward the base; carpel-

lary styles 33–36, primrose yellow, stigma concave, lemon chrome, slightly darker than the base of the stamens; seed pod 2–3 inches in diameter; leaves orbicular, 14–16 inches diameter, pale green above, below dark blue to violet, veins green, margins wavy or undulated, viviparous at the insertion of the petiole, brown, sinuses open. (Ridgway color standard used.)

× NYMPHAEA "SAINT LOUIS GOLD" (BRACHYCERAS), PRING

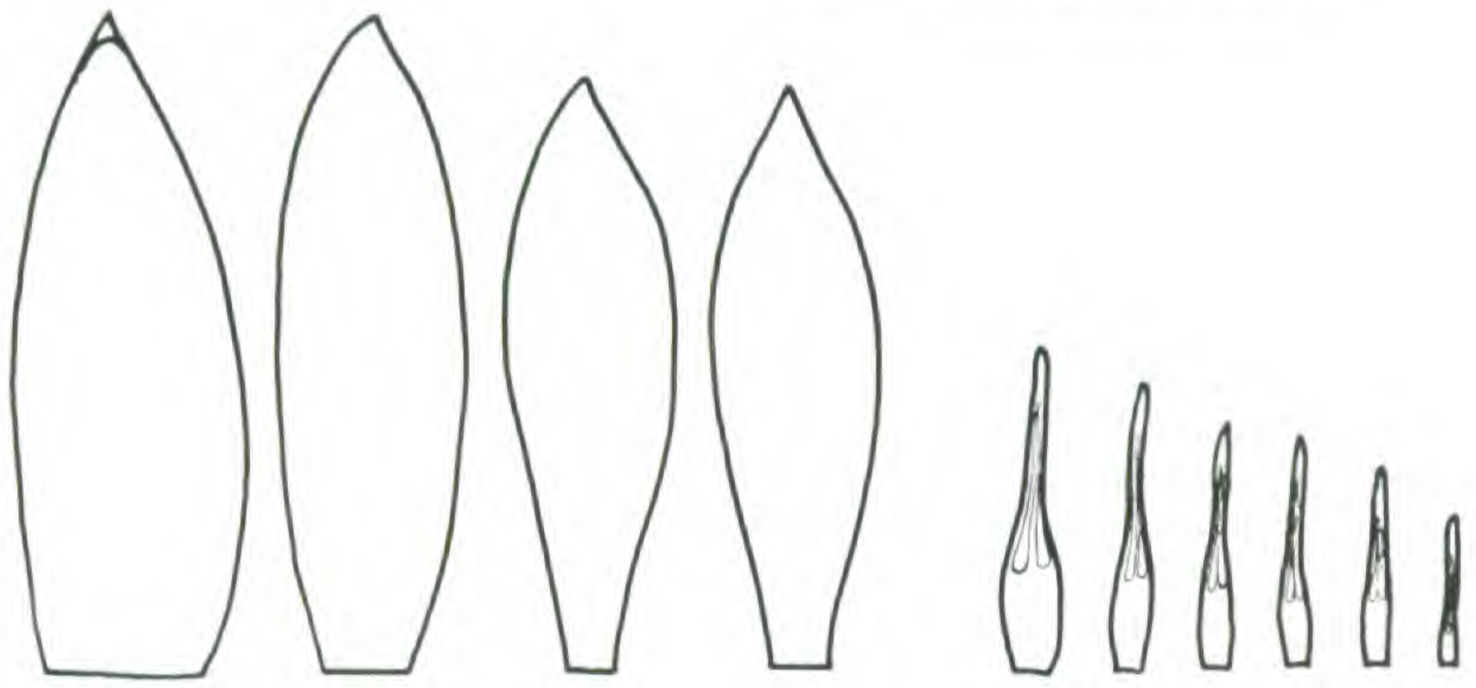
N. Burtii ♀

N. "Saint Louis" ♂

N. "African Gold" ♂

N. Sulfurea ♀

N. "Saint Louis Gold"



Nymphaea "St. Louis Gold". About 1/3 natural size.

Description—Flowers 7–8 inches across; bud narrowly ovoid, dark green; peduncle brown; sepals 4, ovate-oblong, hooded at the apex, 1¼ inches wide, 4 inches long, outer surface dark green, within citron yellow; petals 20–22, citron yellow, comprising 3 rows, outermost row lanceolate, obtuse 3¾ inches long, 1 inch wide; stamens 115–120, 6 rows, outermost row 1¾ inches long, 5/16 inch at the spatulate base, primuline yellow; carpellary styles incurved, primuline yellow; stigma concave, primuline yellow; seed pod 1½–2 inches in diameter; leaves, orbicular, 10–12 inches in diameter, dark green, marmorated with chocolate above, margins wavy or undulated, below dark green, flushed pale blue, venation green, petiole brown, sinuses open. (Ridgeway color standard used.)

A medium sized lily producing citron yellow flowers 7 to 8 inches across. Leaves 10 to 12 inches across are dark green flushed with chocolate brown fading green with age. Suitable for small pools.

Nymphaea "St. Louis Gold"

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the green-houses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.

MISSOURI BOTANICAL GARDEN

Bulletin

Volume XLVI

September, 1958

Number 5

CONTENTS

COVER: *Nyssa sylvatica*, commonly known as Tupelo or Sour Gum, a tree which stands at the southwestern edge of the lake in the North American Tract of the Garden. It becomes the most conspicuous specimen in the Garden in early October when the dark, lustrous green leaves, not unlike those of *Magnolia grandiflora* but smaller and less leathery, change to a brilliant crimson. Tupelo Pool was the name given the lake in a general plan of the Missouri Botanical Garden prepared by the Olmsted Brothers, landscape architects of Brookline, Massachusetts, in 1905. Plants were set out in the North American Tract in the early 1900's according to a synoptical plan following the Bentham and Hooker sequence of families and presumably this tree was planted at that time. Allowing several years for the juvenile stage before being transplanted to its permanent location, it must be almost sixty years old.

Anyone wanting a striking, colorful tree, rivaling a hard maple or a yellow Shagbark Hickory for autumn color, might try a Tupelo. It is well to remember that this tree does best in a moist situation and is difficult to transplant, so should be handled carefully.—Paul A. Kohl (Photo by Paul A. Kohl)

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Missouri Botanical Garden Bulletin

Vol. XLVI No. 5 SEPTEMBER, 1958

INEXPENSIVE BEAUTY

W. F. SCOTT, JR.

EACH year a few dollars of the gardener's budget should be set aside for new plants, exciting things to renew enthusiasm and improve judgment. The daffodil collection is sometimes the last to receive this "modernizing," and since this is the time to buy and plant daffodils, let's give them some thought.

New daffodil varieties do not need to be expensive. It is a challenge to seek out the unusual, and yet find it at a low price. We will try to do just that, find varieties which are "new" in the sense that nine out of ten casual daffodil growers do not own them, yet which have been on the market long enough to bring the price below two dollars. And remember—we are looking for ribbon-winners!

Of the yellow trumpet daffodils (class 1a), few can equal KINGSCOURT. It is outstanding, and for ten consecutive years it won "best yellow trumpet in show" at the Royal Horticultural Society (RHS). Nearly its equal, and preferred by some, are CROMARTY and MILANION. You could not go wrong on any of these.

TROUSSEAU is an exquisite bi-color trumpet (class 1b) which has received high honors all over the world. The perianth is pure white. The trumpet opens a soft yellow, which passes to rosy cream. Other good choices in this class are CONTENT and SPITZBERGEN.

From the long list of fine white trumpet daffodils (class 1c), two stand out from all others. They are BROUGHSHANE and CANTATRICE. These should be in every daffodil collection, for they are lovely, and they are ribbon-winners in any show.

Class 1d must be omitted from this search, for it is a new one and contains very few varieties, most of which are exceedingly high priced. These are the reverse bi-color trumpets. If you feel you just must have one, and are willing to pay $3.00 per bulb, SPELLBINDER is your choice. It is a flower which enchants everyone who sees it.

In class 2a (yellow perianth, large colored cup), GOLDEN TORCH is an ideal choice and quite reasonable in price. Class 2b (white perianth, large colored cup) contains two excellent varieties of high quality and low price: COVERACK PERFECTION and RED HACKLE. Buy both if you can; but if a choice must be made, COVERACK PERFECTION might be preferred.

After the shock of the brightly

colored cups found in classes 2a and 2b wears off, you will find lasting satisfaction in the glistening purity of the all-white class 2c. In this class, KILLALOE is a sure ribbon winner, and LUDLOW is close behind.

Class 2d contains one such utterly charming variety that it deserves special mention. This is BINKIE, and it will captivate you immediately. When the flower first opens, it is entirely a most unusual sulphur yellow. The crown soon passes to a lighter shade, which becomes almost white as the flower ages. The flowers, though not of extremely large size, are very well proportioned and perfectly balanced to the stem height. This is a most unusual daffodil.

In class 3a (yellow perianth, small colored cup) there are very few varieties available. CHUNGKING is a sound choice, at a reasonable price. There are no real show-stoppers in this class.

MAHMOUD is your choice for class 3b (white perianth, small colored cup) for it is probably the best of the red-and-white varieties. The almost flat crown is a glowing ruby red, against a snow white perianth. LIMERICK is an excellent second selection.

The last class of large-flowered hybrids is 3c (all white, with small cup) and the outstanding selection here is CUSHENDALL, which has won the Award of Merit of the RHS. The very shallow crown is delicately cream colored on the frilly edge, and the center is a lovely moss green.

Other RHS Daffodil classes include the Doubles, Triandus hybrids, Cyclamineus hybrids, Jonquils, and all the other small and very interesting forms and species. These are for the lovers of the small and unusual, or for the specialist. Some of them do wonderfully well here. Others, like the delicately scented *Jonquilla simplex*, are at the edge of their natural climate and fail to prosper.

All of the large-flowered hybrids we have discussed have been grown in St. Louis several years, and will flourish in this climate. This is an important feature, for some of the large-flowered beauties do not take kindly to our winters, and succumb in one or two years.

Buy a few new things each year, to bring your collection up to date. Otherwise, your judgment of what is good in daffodils suffers considerably. You must have an ever-new standard of comparison. Get only one, or two, but get the best you can afford in the class. The cheapest is almost never an investment. The best nearly always is.

WHERE TO BUY? There are many dealers, and you may have your favorite. Some of our local gardeners may have small quantities of surplus bulbs to sell or trade, and you may save money by asking questions. Of the large growers, Grant E. Mitsch, Canby, Oregon, is the largest domestic breeder and grower of daffodils. He issues a lovely catalog. P. DeJaeger & Sons, South Hamilton, Massachusetts, import bulbs from their nurseries in Holland, and issue a regular catalog. These are the two most important domestic sources and in their catalogs you should be able to locate almost any variety you wish.

NEW PLANT INTRODUCTIONS FOR 1958

THE Garden has received this year some 150 new plants for introduction into the outdoor collections. Of these, the greatest number have come from the United States Department of Agriculture Plant Introduction Station, Glendale, Maryland. The plants were received in the form of seed, cuttings and small plants. Most of them are now growing in cans and in the cold frames awaiting the fall and spring planting season for incorporation into the Garden. A new, over-all landscape design for the entire Garden is being planned. This will first require a mapping-listing of all plants to give a better idea of what is already here and to serve as a guide for replacements and new accessions. Then will follow a revision of existing plantings.

Listed below are some of the more noteworthy plants received.

BARBERRIES—

Berberis aggregata from the Morris Arboretum.

B. fendleri from the Denver Botanic Garden.

B. Diaphana, B. dictyoneura, B. Gilgiana, B. koreana, B. Poireti, and *B. virescens* from the Botanic Garden of Smith College.

B. Thunbergii var. *vermilion* from the U.S.D.A.

DOGWOOD—

Cornus florida "Cherokee Chief" a red variety from Mr. Clarence Barbre of Webster Groves.

HOLLIES—

Ilex hanceana, I. mutchagara, I. rotunda, I. sugeroki, from the U.S. D.A

I. opaca "Fosteri" from Mrs. Martin Lammert III, St. Louis, Missouri.

I. aquifolium "Dumbarton Oaks" from Dumbarton Oaks estate in Washington, D. C.

I. opaca "East Palatka" and the hybrid, *I. cassine* × *I. opaca* "Teas Holly" from Mr. Clarence Barbre.

LEGUMES—

Albizzia Julibrissin, Mimosa Tree, a new strain having very red flowers, from Mr. Thomas C. Crannage of Belleville, Illinois.

Laburnum vossi, Golden Chain Tree, from Mr. Clarence Barbre.

MAHOGANY—

Cedrela odorata, West-Indian- or Spanish-Cedar, from Brisbane Botanic Gardens, Australia. (A relative of the Mahogany tree important to commerce.)

LILY—

Ophiopogon japonicus, Lily-Turf, from Semmes Nurseries, Semmes, Alabama. A ground-cover, the hardiness of which has not yet been proved in this area, now planted in the Mausoleum grounds.

MAHONIAS—

Mahonia lomarifolia from the U.S. D.A.

M. bealii from Mr. Clarence Barbre.

M. pinnata from Mr. Harvey Templeton of Winchester, Tennessee.

MALLOWS—

Hibiscus Moscheutos "Anne J. Hemming," a large, bright red form of the Rose Mallow, from Eastern Shore Nurseries, Easton, Maryland. This plant is already well established in the Hibiscus collection in the middle knoll of the Garden.

Hibiscus coccineus, a hardy strain, having grown in St. Louis for the past twenty years, with bright red flowers, from Mr. Claude L. Matthews, Ladue, Missouri.

VIBURNUMS—

Viburnum macrocephalum var. *sterile* and *V. judii* from Mr. Harvey Templeton.

—E. L. E.

TREATING BARK WOUNDS BY WRAPPING

THE loss of large sections of bark from tree trunks through automobile collision or other accidents is quite common. The conventional method of treating such wounds consists of cutting away the loosened bark and applying wound dressing materials to the exposed wood. The wound then heals through the formation of callus growth along the edges of the injury; usually this is a long slow process.

An entirely different method of treatment is suggested in a successful experiment made by Andrew T. Leiser of the Department of Floriculture and Ornamental Horticulture, University of California, Los Angeles. In this case, the bark was completely stripped from the trunk of a Chinese elm from the ground upward for a distance of about 4½ feet. Upon discovery some 28 hours after the injury occurred, the loosened bark was removed and the trunk wet down with tap water. Then the injury was wrapped with two layers of polyethylene film. The wrapping was not sealed along the edges, but was tied with cord at the top, middle and bottom. The injury occurred in June; by the following October new bark had formed directly on the sapwood and, with the exception of a few relatively small areas, the wound was covered with this new bark.

The interesting feature of this incident is that new bark developed, not through callus growth along the edges of the wound, but through continued activity of the cambium layer over the sapwood as a result of the protection provided by the polyethylene film. Some cases of similar wound healing have been reported when the injury was shaded either naturally or by burlap screens. When wounds are treated by shading or wrapping, it appears essential that treatment must be made before the cambium layer is killed by the drying effects of long exposure to air.

—Reprinted from the *Shade Tree Digest*, July 1958.

HEDGE APPLES REPELL BUGS

THE hedge apple, the large, green, ball-like fruit of the Osage Orange tree, *Maclura pomifera*, is gaining a reputation as an insect repellant. To quote an *American Nurseryman* writer, "One green fruit, hedge ball, Osage orange, Osage apple or whatever you want to call it, placed in a room

infested with roaches and waterbugs, will drive the creatures out in a few hours," and he further states that such use was discovered by chemists at the University of Alabama.

In recent years there have been a number of reports of the effective use of hedge apples as a roach and waterbug exterminator. Mr. Pring as well as others at the Garden attest that a few hedge apples in the basement and closets have positive results.

Hedge apples drop throughout the fall and winter and the many trees at the Garden usually are quite productive.

THE SILVER NUT TREE, "YIN KOU-TZU"

WHILE it is not generally known, the seed of the Ginkgo when roasted is quite edible. In fact the name Ginkgo comes from the Japanese rendering of the old Chinese name "Yin kou-tzu" meaning silver nut tree. It is also referred to as the white nut tree. The seeds, denuded of their offensive pulp and washed, are a pure white. Roasted "Silver Nuts" are eaten by Orientals at banquets, weddings and other gatherings, being supposed to promote digestion and diminish the effect of wine. They can be found for sale in most market towns in China and Japan. Also you will find them in the Chinatown markets in such cities as San Francisco, Los Angeles and New York. The Ginkgo trees in the Garden or more accurately the female of the species are extraordinarily heavily laden with fruit this season, due, no doubt, to very favorable weather conditions. The branches are so burdened they are breaking with the slightest touch or movement by the wind.

The Ginkgo tree in modern times reportedly is known to occur as a natural forest tree in a single area in China, being usually a tree planted by man for religious purposes or as an ornamental. For this reason the wood is seldom or little used commercially. The wood is white or yellowish-white and is not differentiated into heartwood and sapwood; it is finely grained, quite like White Pine *(Pinus strobus)*; it is easily worked but is of no great value. To a limited degree it is used in Japan as ground work for lacquer ware and for making chess boards and chess men.

The Gingko is first and foremost an ornamental tree of distinct Oriental or patriarchal appearance. While long a revered tree in Oriental Gardens and religious places, it has only in recent years found wide acceptance in Europe and America; the outstanding objection being the foul-smelling fruits borne on the female trees. However, male trees may now be propagated vegetatively for assurance of male trees for planting.

Trees of stately beauty at any time, Ginkgos are especially handsome in the fall, coloring to a rich golden yellow; and when in group plantings as along Flora Place, in the Garden and in nearby Tower Grove Park they are most striking in the autumn landscape.

—E.L.E.

The 1956 systematics symposium participants at the Museum where the fifth annual symposium will be held October 25.
(Photo by Dr. Frederick Meyer)

EUONYMOUS ALATUS, A GOOD SHRUB FOR ST. LOUIS

ONE of the most dependable of shrubs is the Cork-barked or Winged Euonymous, *Euonymous alatus*, which has funny little winged ridges along the sides of the twigs and branches. Whether the summer be wet or dry, the frost early or late, *Euonymous alatus* always colors a deep pinkish red and holds at least some of its bright color long after other shrubs are bare and brown. The Tartarian Maple, by comparison, though more brilliant, holds its leaves only for a few days, frost or no frost, and does not give effective color to the garden for more than a fortnight at the very most. In a protected spot, with *Euonymous alatus* it is frequently almost a month before the very last of the leaves have fallen. Last year, for instance, in spite of several frosts and one or two hard freezes it was bright and attractive during the first week of December.

In general, it is a good all-round shrub for St. Louis. The corky ridges on the twigs make it interesting in the winter landscape. When brought into the house, winter twigs are readily forced into leaf and make unusual table and window sill arrangements for some weeks. It is a shrub that does well in full sun or in light shade, passably well in quite deep shade; and it is readily available from most nurseries. The flowers are greenish and inconspicuous, the fruits, though bright, are small; but the rich deep red of its autumn leaves, year after year, makes it a fine shrub to live with.

—E. A.

FIFTH ANNUAL SYSTEMATICS SYMPOSIUM

THE fifth annual symposium on systematics is to be held at the Garden on October 24 and 25. This symposium brings together botanists and zoologists, principally from the Central United States, to discuss problems of classification and evolution. This year the effects of Man's activities on these fields will be considered. Dr. Edgar Anderson of the Garden and Dr. Robert Usinger, University of California, Berkeley, will serve as chairmen. Following is a list of speakers and the papers they will present for discussion:

Dr. F. R. Fosberg, Pacific Vegetation Project, "Man's Activities as a Dispersal Agent."

Dr. Robert R. Miller, University of Michigan, "Man and the Changing Fish Fauna of the American West."

Dr. H. H. Ross, Illinois Natural History Survey, "The Potential Effects of Man's Activities on the Insects."

Dr. Jonathan Sauer, University of Wisconsin, "Man's Effect on Taxonomic Discontinuities in Plants."

Dr. G. Ledyard Stebbins, University of California, Davis, "Habitat Disturbance by Man as an Accelerating Factor in Plant Evolution."

The Symposium is in part supported by a grant from the National Science Foundation. Last year the meeting was attended by nearly 200 professional biologists and students.

HORTICULTURAL COURSES AT THE GARDEN
1958-1959

Course I—Bulb Forcing
Instructor: Mr. Clarence Barbre

The course consists of one meeting in which instruction will be given in bulb forcing and outdoor bulb culture, followed by a practice period in which each student will plant, in five 7-inch bulb pans, at least 24 top-quality bulbs—tulips, Narcissi (daffodils and paper-whites), and hyacinths. These will be kept in the Garden bulb pit under cold treatment and in the greenhouses until ready to flower (total of 60–80 days). Each student will be notified when to call for the bulbs. This course is intended primarily for those having no previous instruction in bulb forcing.

Five sections are offered:

Section 1, Tuesday, October 14, 7:00–9:30 P. M.

Section 2, Thursday, October 16, 9:00–11:30 A. M.

Section 3, Friday, October 17, 1:00–3:30 P. M.

Section 4, Tuesday, October 21, 9:00–11:30 A. M.

Section 5, Wednesday, October 22, 1:00–3:30 P. M.

Registration: September 8 through October 8. Fee: $8.00.

Course is given in the Experimental Greenhouse, Missouri Botanical Garden (Enter Cleveland Avenue gate, 2221 Tower Grove Avenue).

Course II—Plant Propagation
Instructor: Mr. Clarence Barbre

Again there will be two divisions (A and B) of the Plant Propagation Course. In each division the class will meet twice for a lecture-discussion session followed by a student-practice session. The general objectives of both divisions are the same. Propagation methods, tools, and techniques to conform to the needs of the plant material used will be discussed, thus giving the student understanding and skill in production and care of plants suitable for the home grounds. One plastic-covered propagating box and approximately 40–50 kinds of plants will be provided per student. The lecturer will discuss methods of vegetative propagation: root cuttings, suckers, divisions, hard and soft wood stem cuttings, leaf, bud and scale propagation.

Division A: The student practice will emphasize soft wood propagation of evergreens, principally broad-leaved, such as holly, ivy, azaleas, Euonymous, etc. Some attention will be given to winter care and propagation of house plants.

Four sections are offered:

Section I, Mondays, September 22 and 29, 1:00–3:30 P. M.

Section II, Tuesdays, September 23 and 30, 7:30–10:00 P. M.

Section III, Thursdays, September 25 and October 2, 9:30–12:00 Noon.

Section IV, Fridays, September 26

and October 3, 1:00–3:30 P. M.

Registration: August 18 through September 18.

DIVISION B: The student practice will emphasize propagation of house plants, such as Begonias, Dieffenbachias, Philodendrons, etc. Some attention will also be given hard wood cuttings.

Four sections are offered:

Section I, Mondays, January 12 and 19, 1959, 1:00–3:30 P. M.

Section II, Tuesdays, January 13 and 20, 1959, 7:30–10:00 P. M.

Section III, Thursdays, January 15 and 22, 1959, 9:30–12:00 Noon.

Section IV, Fridays, January 16 and 23, 1959, 1:00–3:30 P. M.

Registration: December 7 through January 7.

Fee: $12.00 each division.

The course is given in the Experimental Greenhouse, Missouri Botanical Garden (Enter Cleveland Avenue gate, 2221 Tower Grove Avenue).

COURSE III—SPRING HORTICULTURE

Instructor: Mr. Clarence Barbre

This is a course in practical spring gardening, the growing of annuals and perennials from seed. Each of the five meetings will include a lecture period in which will be discussed the factors affecting plant growth and the practical means for their control, such as optimum supply of heat, light, moisture, air, fertilizer, the application of lime and mulch and the control of pests and diseases. There will also be a practice period in each day's meeting for which each student will receive seeds and four metal flats with sterilized soil. There will be enough space to grow about 300 to 350 seedlings which, with the flats, will become the property of the students. Seeds of plants particularly desired by any student should be brought to the first meeting.

Four sections are offered:

Section I, Wednesdays, March 18, 25 and April 8, 15 and 22, 1:00–4:00 P. M.

Section II, Fridays, March 20, 27 and April 10, 17 and 24, 9:00 A. M.–12:00 Noon.

Section III, Mondays, March 23, 30 and April 13, 20 and 27, 1:00–4:00 P. M.

Section IV, Tuesdays, March 24, 31 and April 14, 21 and 28, 7:00–10:00 P. M.

Registration: February 13 through March 13.

Fee: $18.00.

The course is given in the Experimental Greenhouse, Missouri Botanical Garden (Enter Cleveland Avenue gate, 2221 Tower Grove Avenue).

COURSE IV—GROWING ORCHIDS IN THE HOME

Instructor: Mr. Robert J. Gillespie

A one-day course of instruction with the following schedule:

10:00 A. M. Discussion of orchids suitable for home culture and the best ways to grow them, with potting demonstration.

12:00 Noon. Lunch time, coffee and soda supplied by the Garden.

1:00 P. M. Unusual containers such as baskets, slabs, poles, etc., for growing orchids in the home, with examples and demonstration of potting and care.

2:00 P. M. Inspection of greenhouses.

3:00 P. M. Individual potting instructions by members of Orchid Department staff. Students may take potted plant home.

Two sections are offered:

Section I, April 18, 1959.

Section II, April 25, 1959.

Fee: $10.00.

Course is given at the Orchid Range, Missouri Botanical Garden, Tower Grove and Flora avenues.

COURSE V—ADVANCED ORCHID GROWING

Instructor: Mr. Robert J. Gillespie

This course for the advanced orchid grower is offered in two divisions (A and B).

DIVISION A: How to Make Orchids Flower. A discussion of how environment influences growth and flowering in the major cultivated genera of the Orchidaceae. Lights and other devices for controlling flowering will be explained. There will be a laboratory session followed by a question and answer period.

Division A meets November 18, 7:00–10:00 P. M.

Division B: Greenhouse Culture of Orchids. Instruction in the fundamentals of growing orchids in the greenhouse. Ventilating, watering, heating, shading, cooling, greenhouse design, automatic equipment, and new construction methods and materials will be discussed and illustrated in the Garden's Orchid Greenhouses.

Division B meets May 2, 1959, 1:00–4:00 P. M.

Both divisions will meet in the Orchid Range, Missouri Botanical Garden, Tower Grove and Flora Avenues.

Fee: $5.00 each division.

"BOTANY EVENING"

THE students in Dr. Anderson's evening classes last April and May have initiated a series of "Botany Evenings" at the Garden, continuing in an informal way their studies of garden plants and wild flowers. The first such evening was held in early June. Two meetings held in September were particularly designed for those who had taken the evening courses in the classification and identification of plants. It is planned to follow them with once-a-month meetings open to all "Friends of the Garden." Visitors are encouraged to bring plants which they would like to have identified or flowering specimens of unusual horticultural and botanical interest to demonstrate to other members.

"Botany Evening" meetings are held in the Museum Building just inside the Cleveland Avenue gate. Announcement of dates of monthly meetings will be made later.

NOTES

THE Garden is proud to welcome Dr. Frits W. Went as its new Director. He is also a Professor of Botany in the Henry Shaw School of Botany at Washington University.

Dr. Went was born in Utrecht, The Netherlands, in 1903. His father, Prof. F. A. F. C. Went, was a Professor of Botany at the University of Utrecht and Director of the Utrecht Botanic Garden. Young Frits, having grown up in such surroundings, had a natural interest in Botany. He was educated at the University of Utrecht and later became a plant physiologist at the Royal Botanic Garden of Buitenzorg in Java.

In 1933 Dr. Went came to the United States and to the California Institute of Technology as an Assistant Professor. Two years later he was promoted to full Professor. At Cal. Tech. he originated the "phytotron," a specially designed air-conditioned greenhouse where moisture, heat, light and other factors in the growth of plants are automatically controlled. He, with several other scientists, discovered the effect of hormones on the growth of plants, thus leading the way to new scientific advances in Horticulture.

While in Southern California, Dr. Went did much to aid in the promotion and establishment of the Los Angeles State and County Arboretum at Arcadia, California. He has contributed much time and energy in all fields of Botanical study and research.

Dr. Went is married and has two children. He is a member of many scientific societies, including the National Academy of Science, and is an honorary doctor of the University of Paris.

A former graduate student at the Garden, Dr. Norton H. Nickerson, is welcomed back as the Garden Morphologist. He is also a member of the faculty of Washington University. Dr. Nickerson received his Ph.D. degree from the Henry Shaw School of Botany in 1953, studying with Dr. Henry N. Andrews, Jr., and Dr. Edgar Anderson.

Since receiving his degree he has taught at the University of Massachusetts and at Cornell University. At Cornell, Dr. Nickerson helped initiate and organize the summer program for teachers given there in 1957, with the support of the National Science Foundation, and in which Dr. Andrews and Dr. Anderson of the Garden staff participated.

As a part of his work this year Dr. Nickerson will help organize adult classes in botany to be given at the Garden.

Dr. Edgar Anderson spent two months this summer on several distinct projects in various parts of the New World. For three weeks he was a guest of the Center for Advanced Studies in the Behavioral Sciences at Palo Alto, California, assisting various social scientists in analyzing their data by his methods, originally developed for measuring differences between

Mexican corn fields. From Palo Alto he flew to the University of Alaska to assist with a National Science Foundation teacher-training course for five days, then to Costa Rica where he attended the 33rd Congresso de Americanistas. From Costa Rica he flew to Colombia where he continued work with the international project concerned with the preservation, classification, and description of the races of corn in the New World.

Dean Henry Andrews has been in Europe all summer on a Guggenheim Fellowship and will remain there during the fall and early winter, studying fossil plants and conferring with European authorities. Ever since he spent part of his student years in Europe, Dean Andrews has been particularly interested in the fossil plants which are found in coal mines. He has become one of the world's outstanding students of the fossils in coal and in rocks associated with it. An increasing number of authorities have been trained under him in the Henry Shaw School of Botany. For him a "field trip" means loading a station wagon with students and simple mining equipment and starting off for a few days in the coal fields of Illinois, Kentucky or Kansas.

In the last few years his work has given him new insights into a much more difficult problem, not the plants of the Age of Coal, but the more primitive plants which preceded them when life evolved out of the seas and cnto the land. It is these new ideas which he has taken to Europe with him, ideas not yet developed to the point where he wants to put them all down on paper; ideas rather at the growing stage where he needs to try them out on other experts and particularly on collections of fossil plants in European museums. In letters received at the Garden, he writes enthusiastically about the way his work has been going during the summer and how his ideas have developed under the impact of his studies in European museums.

FALL EVENTS

September

27–28 Dahlia Show, Greater St. Louis Dahlia Society, in Floral Display House.

27–28 Flower Show, Better Garden Clubs of Greater St. Louis, Museum and Shaw House.

October

4–26 House Plants, Old and New, Floral Display House.

11 Veiled Prophet Queen's Reception for School Children, Shaw House.

18 Junior League Show, Floral Display House.

24–25 Fifth Annual Systematics Symposium, Adm. Bldg. and Museum.

29–30 Indian Art Exhibit, 8th. Dist., Mo. Federated Women's Clubs, Museum.

November

8–30 Chrysanthemum Show, Floral Display House.

December

1–7 Chrysanthemum Show, continued.

14–31 Poinsettia Display, Floral Display House.

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.

MISSOURI BOTANICAL GARDEN

Bulletin

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COVER: *Cattleya* × *Mayor Tucker*, a new cluster-type Orchid hybrid with dark lavender-purple, beautifully-shaped flowers with ruffled lips. The parents are *Cattleya Bowringiana* var. *Splendens* and *Cattleya Juanna*. (See article, page 75). Photo by Lad Cutak.

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HYBRIDIZING CLUSTER-TYPE CATTLEYAS

ROBERT J. GILLESPIE

THE desire for something new and different is a universal human trait that pervades all phases of man's activities. Orchid hybridists are by no means the exception to this rule. In recent years many breeders have been turning their attention to some of the small-flowered Laelia and bifoliate (two-leaved) Cattleya species as a source of genetical material for the production of new and unusual orchids. Actually the Cattleya tribe contains a large number of small-flowered species, only a few of which have been used to any degree by the modern hybridists. By crossing some of these small-flowered species of Cattleya with the large-flowered species and with the large-flowered Laelias, orchid breeders are now producing an exciting array of new hybrids, many of which will be unusual and strikingly different from the commercial hybrid Cattleya popular today. Many amateur orchid hobbyists are now becoming interested in hybridizing these small-flowered Cattleyas and many of them are producing excellent hybrids. It is the purpose of this article to further stimulate their interest by discussing some of the more common breeding problems encountered with these hybrids. Sterility, floriferousness and flower size, and flower color will be briefly discussed.

STERILITY

Genetically the bifoliate Cattleyas seem to be quite distinct from the large-flowered labiate Cattleyas and Laelias. Complicated interspecific and intergeneric Cattleya and Laelio-Cattleya hybrids, which have varying degrees of polyploidy (having more than two sets of hereditary structures, the chromosomes), exhibit a surprisingly high degree of fertility. On the other hand, some of the simple bifoliate-labiate Cattleya hybrids are completely sterile. Investigation of these sterile hybrids almost invariably indicates that sterility is due to polyploidy. This sterility is present regardless of whether the bifoliate or the labiate parent has introduced the polyploid condition into the hybrid. For example, *Cattleya* × *Chapmanii* var. *Splendens* (triploid), is a sterile bifoliate-labiate hybrid in which an extra set of chromosomes was inherited from the bifoliate parent, *Cattleya Bowringiana* var. *Splendens*, which is a tetraploid. The reverse situation is found in *Laelio-Cattleya* × *Tangerine*, a Missouri Botanical Garden hybrid between *LC.* × *Mimi Koehler* (polyploid, exact cultivar unknown) and *Cattleya aurantiaca* (diploid); for this hybrid inherited its polyploid condition from the labiate Laelio-Cattleya parent. *LC.* × *Tangerine* is

a beautiful yellow cluster-type orchid which would made an excellent parent for future breeding work; but thus far it has been completely sterile. A hybrid half-sister to *LC.* × *Tangerine* is *C.* × *Confetti*, a primary bifoliate-labiate hybrid in which both parents (*C. Trianae* var. *Delicata* and *C. aurantiaca*) are diploids. (A hybrid is a *primary* hybrid if neither of its parents was a hybrid.) The diploid hybrid, *C.* × *Confetti*, has proved to be extremely fertile and all seedlings from it are vigorous, normal growers. Although it is not our purpose here to attempt an explanation of why sterility in these hybrids is always coupled with polyploidy, theoretically, it should be possible to produce a completely fertile bifoliate-labiate Cattleya hybrid by crossing a selected tetraploid of the bifoliate group with a selected tetraploid of the labiate group. The Garden is now in the process of making several such carefully controlled crosses and the results, combined with cytological investigations, should be enlightening.

FLORIFEROUSNESS AND FLOWER SIZE

Frequently hybridizers have expressed disappointment with cluster-type hybrids because they fail to have a desirable flower size and/or sufficient number of flowers per stem. Most breeders attempt to predict floriferousness and flower size of their hybrids by using the arithmetic mean. Actually, the flower size and floriferousness of any proposed or existing cross can be accurately predicted by employing the geometric rather than the arithmetic mean. The Garden's *Cattleya aurantiaca* hybrids will once again adequately illustrate this point. In *Cattleya* × *Confetti*, the *C. trianae* parent has a flower spread of 12.0 cm., while the *C. aurantiaca* parent has a flower spread of 2.5 cm. By using the arithmetic mean to compute the average flower-spread to be expected in the hybrids between these two plants, we obtain 7.3 cm. ($2.5 + 12.0 = 14.5$; $14.5 \div 2 = 7.25$ cm.). However if we employ the geometric mean, we would predict that the hybrid flowers should be about 5.4 cm. in width, on the average ($2.5 \times 12.0 = 30$; $\sqrt{30} = 5.4$ cm.). When we actually measure the spread of the flowers of the hybrid plants produced we find that it varies from 5.3 to 5.5 cm., which is evidence that the geometric mean method is reliable and accurate. The accuracy of the geometric mean when used to predict floriferousness can be illustrated by the hybrid *LC.* × *Tangerine*, of which one parent, *LC.* × *Mimi Koehler*, has 3 flowers per stem, while the other parent, *C. aurantiaca* has 22 flowers per stem. Computing the geometric mean ($3 \times 22 = 66$; $\sqrt{66} = 8.1$ cm.), it is calculated that the plants of this cross will average 8 flowers per stem. Although this hybrid is only reaching maturity, those few plants which are mature have 7–8 flowers per stem. This shows how the plant breeder can, with surprising accuracy, determine flower size and floriferousness of any primary bifoliate-labiate Cattleya hybrid even before the cross is made.

COLOR

One of the alarming practices which

some orchid breeders have been employing recently is the crossing of a white labiate-type hybrid Cattleya with a colored cluster-type Cattleya or Laelia, presumably on the assumption that the white Cattleya will act genetically as it appears physically, that is to say, as a "white" or "neutral" background against which the brilliant colors or unusual markings of the smaller-flowered parent can be expressed in a dominant way in the hybrid. To prove the fallacy of such thinking, one has only to review Hurst's classical paper on white Cattleyas, published in 1925 (*Experiments in Genetics*) and frequently reviewed by numerous authors in many subsequent publications. Hurst's work shows that the white labiate Cattleya can be thought of as a machine, built exactly like its colored counterpart, with its germplasm containing factors for color, the usual emphasis on a darker labellum, etc. The only thing which sets it apart is the fact that somehow a small piece of the genetic machine is missing. Thus the entire color machine is latent and cannot function even though ninety percent of it is in perfect running shape. When the white labiate Cattleya transmits this machinery to offspring who have received the missing genetical part from another parent (presumably any colored parent would do this), the result, of course, is that this unknown color machine can function and express itself in the progeny. Therefore it becomes quite evident that the white labiate Cattleyas cannot be thought of as "neutral" or "passive" background in hybridizing; they will produce a variety of unpredictable and frequently undesirable color types in their progeny.

SUMMARY

In hybridizing cluster-type Cattleyas, 1) sterility in primary hybrids is usually associated with polyploidy, 2) floriferousness and flower size in the hybrid follow the geometric mean of these characters between respective parents, and 3) white labiate Cattleyas cannot be used as genetically "neutral" color parents; they contribute significantly to the flower color of their progeny.

CATTLEYA × MAYOR TUCKER

We at the Missouri Botanical Garden are particularly pleased with the cleaning up of our city air. When air pollution in St. Louis became worse and worse, it finally became impossible to grow our famous orchids in town any more; and in 1926 the whole orchid collection had to be moved to Gray Summit. For display and for the orchid shows, plants had to be moved back and forth to town. But now, with clean air restored to our city, the orchids have been moved back into town; and they do very well. Actually, we have not once observed a situation, so-called dry-sepal, which causes much damage to Cattleya flowers in the Los Angeles and San Fran-

cisco areas of California. Dry-sepal occurs generally after periods of smog; its lack in the St. Louis area, as well as the lack of damage to vegetables shows that our air here is cleaner than in any other American city of equal size. Therefore, in tribute to the man who did more than anyone else to clean up our air, and to make Cattleya culture possible again in St. Louis, the Garden's newest Cattleya hybrid (see cover), one of the newer cluster-type orchids from the cross *Cattleya Bowringiana* var. *Splendens* × *Cattleya Juanna*, is named "Mayor Tucker" (See cover illustration).

—F. W. Went

Pittosporum Tobira, a well-established tub plant at the Missouri Botanical Garden. Photo by Kenneth Peck.

TREES AND SHRUBS AS TUB PLANTS

E. L. EVINGER

ALMOST all homes and many apartments, as well, have one or more places where a tub plant or perhaps a pair of them may be placed to add much to the attractiveness and charm of living. Homes with small yards or patios can use them to dress up otherwise bare and uninteresting corners. They can be used for privacy and concealment—a vine in a large container will screen off the barbecue pit or hide the trash disposal cans. Tub plants have the advantage of being movable to accommodate special occasions (or the mere whim of moving things about as you might the furniture in your living room). They are distinctive as a decorative furnishing for the home. In addition to being unusual in itself, a potted tree, shrub or vine offers the home gardener the opportunity to express his own individuality in the selection, growing and shaping of it, thus making possible for him to have a unique plant unlike that had by any other. We all strive to have something which is a product of our own creation and effort; and living plants, although having individuality and charm of their own, are admirably adaptable to our fancies.

PLANTS SUITABLE FOR TUB PLANTS

The field from which to select a plant for tubbing is wide and exceedingly varied. Deciduous trees which make excellent specimens are Japanese Maples, Flowering Cherries, Ginkgos and Oaks. Among the conifers are numerous possibilities such as Deodar and Lebanon Cedars, Austrian and Japanese Pine, Umbrella Pine (Sciadopitys), Araucaria and Podocarpus. The evergreen broadleaved shrubs likewise offer a variety of good tub plants, for example Pittosporum, Oleaster (*Elacagnus spp.*), Privits and the exotic and tropical Coral Tree (Erythrina). For colorful flowering effect all summer, many varieties of Lantanas can be grown as trees. Other shrubs such as Camellias and Gardenias provide spectacular flowers in their season. The Golden Bamboo (*Phyllostachys aurea*) and the varieties of true Ginger (Zingiber) lend an Oriental as well as a very modern touch. A tropical feeling can be obtained through the use of giant-leaved Philodendrons, Cycads, Strelitzias, or perhaps Bananas. Trellised vines such as Grape Ivy (*Rhoicissus rhombifolia*), Wisteria, Bougainvillea, Fatshedera or English Ivy can be styled to make a screen or massed effect.

HOW TO SELECT A TUB PLANT

Some one of these plants is certain to be within the reach and ability of the average home gardener. Like African Violets, tub plants are fussy and require a lot of attention and care which is true of many things really worth while. In selecting a plant for tubbing, first visualize the maximum size you want or can accommodate, then select a suitable container. The tub, pot, or other planter must not be

too large (a twelve inch tub will hold a six foot tree). You will naturally need to begin with smaller pots for small plants and transfer from time to time to larger pots as the plants grow, until they reach the desired size. It is preferable to have a container that drains and is provided with a saucer or drip pan. Should you select a container which does not drain, such as a brass kettle, an old churn or some fancy jardinière, then it is best to put the plant in a clay pot liner. The most desirable tubs are made of wood, preferably California Redwood, Southern Cypress or Western Red Cedar, since these materials are rot-resistant. Tubs of other woods can be made long-lasting by treating them with a wood preservative stain or paint. As a refinement the tubs may be equipped with castors and/or handles.

PLANTING INSTRUCTIONS

Most any rich well-drained soil is generally satisfactory for potting, however if the plant selected is something quite special it would be best to consult a gardening encyclopedia or ask your nurseryman for advice. Place a layer of broken clay pots, coarse gravel or other porous material over the entire bottom of the container to give maximum drainage. When using a container which does not drain and you feel you must plant directly without a liner use an inch or so of charcoal as the porous material to aid in keeping excess water sweet (or from becoming stagnant). Fill the tub with soil only to within an inch or two below the upper edge. This amount of space when filled with an inch of water at watering time will be equivalent to that much rain, which generally will be sufficient.

CARE OF THE PLANTS

We all know that plants are dependent for their sustenance upon the available sunlight, water, minerals and carbon dioxide. We must provide, therefore, as nearly as possible, the conditions for growth to which the type of plant we are culturing is accustomed in nature. Sun plants must be given full sun and shade plants the proper filtered light. *Water carefully as needed*, never allowing the soil to become completely dry and, on the other hand, being careful not to overwater or to allow the soil to become soggy wet. Living as they must in a confined soil space, tub plants must be provided with the essential minerals by the application of proper fertilizers. A general rule is to use an organic fertilizer such as fish oil, bone meal or cottonseed meal for broadleaved evergreen plants. Commercial or balanced mineral element fertilizers are satisfactory for other plants. When in doubt it is best to consult a gardening encyclopedia or your nurseryman. Feeding no more than once a month is usually sufficient.

SHAPING THE PLANT

The shape or style of the plant is quite important. This depends largely on the type of plant and your decorative requirements. Generally speaking, tub plants should not be pruned, that is, not in the ordinary fashion of snipping off branches, for you want to keep as many of the young green

leaves as possible. The best practice is to watch the plants carefully and pinch out the terminal buds as the plant reaches the desired size. The direction of growth can be altered or encouraged in this way. Do not be afraid to nip these buds—plants are long-suffering and will respond to our whims or fancies. The original selection of the particular plant subject to use for tubbing is of utmost importance in regard to shaping. Oftentimes while looking over a nurseryman's stock it is interesting to consider some of his "pot- or can-bound" stock which have been naturally dwarfed by their containers. These plants frequently have a made-to-order character already achieved or started. The custom of "can culture" by nurserymen has brought to light many species of plants which will tolerate cramped growing space. Such plants become dwarfed and thus they make excellent tub specimens. However, watch carefully when looking at nursery stock, for those kinds which seem to adjust their growing habits to the container as opposed to those which are decidedly unhappy and probably unsuited to tub culture.

OFF-SEASON CARE

The over-wintering or off-season care of tub plants frequently presents a problem. After frost or a ripening period, deciduous types grown outside may be placed in a basement or garage with very little light, where they require a minimum of watering and

Elaeagnus pungens var. *Simonii*, an attractive tub plant, handsome for its silvery-brown foliage, with many decorative uses at the Missouri Botanical Garden. Photo by Kenneth Peck.

only an assurance that the temperature will not go below 26 degrees Fahrenheit. The broadleaved evergreens and the more tropical kinds of plants, if not to be kept in their regular places in the home, must be placed in a solarium, a bay window or other light place where the temperature will not drop below fifty degrees Fahrenheit at night. They will of course need watering. Nurseries frequently offer "boarding space" as a service to tub plant owners.

TUB PLANTS NOT "BONSAI"

The growing of plants, particularly the tree types, in tubs or other suitable containers should not be confused with the true dwarf or "Bonsai" trees. This kind of culture is an art in itself and requires study, care, time and infinite patience to produce an artistic creation. However, plants kept properly in tubs will live and flourish over a long period of time. They will adjust themselves to their surroundings and frequently achieve a dwarf state not unlike a true "Bonsai".

The size of tub plants and their care, particularly in the off-season, presents a problem. Still we find it inherent in our natures to be interested enough to accept the challenge of having them about. One need only think of how our grandmothers went to all the work, worry and inconvenience of carrying her house plants and even fruit trees across the country in a covered wagon to realize this fact.

A CENTURY OF PLANTING

It is perhaps a mark of Shaw's Garden that, after nearly one hundred years of growing orchids and other exotic things, the Garden can now claim the "world's best collection of philodendrons." The Veiled Prophet Queen carried a bouquet of 300 orchids from the Garden, while philodendrons trail over many a kitchen window or end table. But there is nothing common about any growing thing, and Shaw's Garden treats them all—in research or display—with democratic respect.

The progressive approach of the institution characterizes its plans for a centennial observance next fall. Last year, more than 217,000 persons were attracted by the Garden. This figure strongly reversed a trend of declining attendance that had set in perhaps because of television and the move to the suburbs. St. Louisans have not lost interest, certainly, any more than they have been willing to call the Garden by the official name, Missouri Botanical Garden, which merchant Henry Shaw chose for it before be willed his Tower Grove estate to the public.

But even St. Louisans do not always know how famous their Shaw's Garden is. It is ranked by botanists as the equal of London's Kew Gardens; it has an international reputation as a training center. Nearly a century old, it is no century plant that flowers once and dies; it flowers constantly for anyone who would look through its gates.

(Reprinted from the Editorial in the October 8, 1958, *St. Louis Post Dispatch.*)

NEW HOSTAS RECEIVED BY GARDEN

THE Garden has recently received a fine group of Hostas (Plantain Lilies) from the Botanic Garden and Botanic Museum of the University of Uppsala at Uppsala, Sweden. The group, which has been added to the collection growing in the Mausoleum grounds, consists of the following species, varieties and forms:

Hosta albomarginata, Hosta crispula, Hosta decorata, Hosta clata, Hosta fortunei var. *albopicta, Hosta fortunei* var. *albopicta* f. *aurea, Hosta fortunei* var. *albopicta* f. *vindis, Hosta fortunei* var. *hyacinthina, Hosta fortunei* var. *obscura* f. *marginata, Hosta fortunei* var. *stenantha, Hosta fortunei* var. *rugosa, Hosta lancifolia, Hosta seiboldiana* (Typ.), *Hosta sieboldiana* var. *elegans, Hosta ventricosa, Hosta undulata, Hosta undulata* var. *univittata* (2 selections). —E.L.E.

BOOK REVIEWS

Enjoying America's Gardens. By Joan Parry Dutton. 311 pp., 28 pp. ills. Reynal & Company, Inc., New York, N. Y. Price $5.00.

THIS book has a special quality, which you see at once when you take it up. At the beginning of each chapter there is a delightful pen drawing, fitting in beautifully with the text (but why was the artist, Grambs Miller, not mentioned on the title page?). As one starts to read one is soon absorbed by the author's fresh outlook and beautiful style, and by her interesting information. Mrs. Dutton writes about flowers, which she knows so well, about the great horticulturists who introduced them, about the gardens where they grow or their countries of origin, about the growers she has met, but above all, she writes about America. And she does this superbly well. She came here from England for a visit, but soon became so engrossed by America, its land, people, plants and gardens, that she stayed for years, and returned again after a trip back home. By the way, she met an American and married him. We Americans will enjoy listening to Mrs. Dutton, and will gain a new perspective of our country, whereas her book will be equally informative to the traveler from abroad.

There is only one of the 27 chapters which is all about a garden, and this is about "Magnificent Longwood". But in the last chapter Mrs. Dutton sums up her garden experiences: "To compare America and England gardenwise is not only unfair but absurd. America as a whole is not so garden-minded as England, which probably has more gardens, more home gardeners than any other country of the world. To England gardening is as painting is to France or skiing to Switzerland. About ten million out of forty-two million English are gardeners; Amer-

ica's gardening population is probably no more than five million among a total population of one hundred and sixty million. Make no mistake, however, half as many gardens as England is a lot of gardens, and America is less than half England's age." It is good to ponder this: for we Americans are still far removed from the desirable goal: a garden for everyone, whether it be the vast expanses of a country estate or a small window box in an apartment.

You want another reason to read this book? Listen to this statement: "If I were asked if there was one single feature of American gardens as a whole which had caught my attention, I would unhesitatingly say the lack of hedges." If you agree, you will want further similar information; if you disagree, find out why the author came to this conclusion.

The spelling of Latin names could be improved in many cases (e.g. on p. 154, thyrsiflorus, Artemisia and Eschscholzia are misspelled), but this is about the only criticism I have.

—F. W. Went

Exotica. Pictorial cyclopedia of indoor plants. Alfred Byrd Graf. Roehrs Company, Rutherford, N. J. 1958. 4000 illus., 644 pp. $17.50.

THE last two decades have seen a revolution in the way tropical and subtropical plants have been introduced into cultivation in the temperate zone. Glass-sided homes, fluorescent lighting, plastic glass, and air-controlled equipment have made it possible for millions of Americans to live with tropical plants throughout the year if they so desire. The five-day week has brought to people with lively minds the need for more absorbing hobbies. The rise of mass-production ornamental horticulture has been one of the results. The gardens and the jungles of the tropics and subtropics are being combed for likely plant material.

A little-known species or hybrid of *Peperomia* or *Syngonium* may now be in mass production within two years from the time it was first collected in the back corners of Brazil. There are already over 150 species and varieties of *Philodendron* in cultivation in this country; hybridization programs are well under way which will multiply the number of named varieties in another decade. The total national business in African violets alone, I am reliably informed, now grosses more than all the nursery business in temperate and tropical fruits, apple trees, peach trees, current bushes, avocado trees, and so on. The poorly known genus *Schefflera* was of so little commercial importance when the last edition of Bailey's *Manual of Cultivated Plants* was being planned that it did not even qualify for admission. Today the production of large tubbed specimens for glass-sided office buildings has become big business. One can scarcely stroll through the business district of a city in the eastern United States without seeing a *Schefflera* (or near-*Schefflera*, for the precise limits of the genus have not yet been worked out) in a bank or cafeteria.

This trend is the raw material of social history; it is changing various kinds of attitudes toward plants and toward their cultivation and study, in all classes of society in the United States. Eventually our technical, botanical and horticultural works will catch up with this flood of new introductions and reduce to some kind of order their identification, history, and significance. Until then, the amateur, the social historian, the horticulturist, even many taxonomic botanists will get their most immediate help out of Graf's remarkable book. Most systematists who give their concentrated attention to the sections of the book dealing with their own specialties will wince at the inaccuracies they find; many of them, however, will learn to use the book as an effective first approach to the other fellow's specialties. That anyone should have been able to survey this rapidly growing flood of exotic plants is a marvel; that a busy executive like Graf should have produced this 644-page compendium approaches the miraculous. He is the manager and a director of the Roehrs Company of Rutherford, New Jersey, one of the principal dealers in and growers of this kind of plant material.

The chief feature of the book is some 450 pages of clear photographs illustrating close to 4000 of the species and varieties of tropical and subtropical ornamental plants. There are indices to common names and scientific names, a glossary of botanical terms, short semi-technical descriptions, a section on pest control, and a discussion of the climates from which these plants came, complete with a climatic map of the world. There are short introductory pages on the care of house plants (don't overfeed and don't overwater!) which are of more practical help to the average intelligent person than most books on the subject.

One of the most valuable features of the book is a 40-page summary of the kinds of places where these plants have been collected. There are on each of these pages three or four of Graf's excellent photographs showing the deserts and jungles, the temples, gardens, and nurseries from which ornamental plants have been gathered. Graf's comments supply an effective summary of the conditions under which ornamental plants are being grown in various parts of the tropics, as well as considerable insight into why they are being grown and the various ways in which they are being used. Since he has traveled and collected throughout the tropics with an inquiring mind and a good camera, he has unwittingly produced our first compendium of tropical man's attitudes toward plants.

—Edgar Anderson

Missouri Botanical Garden and
Department of Botany,
Washington University

(Reprinted from *Science*, August 8, 1958.)

SPRING FLOWER SHOW CALENDAR

February	
7–28	Orchid Show
March	
1–15	Orchid Show continued
28–29	Easter Display
April	
4–5 (depending on season)	Daffodil Show
May	
2–3	African Violet Show
18–19	Spring Flower Show
23–24	Rose Show
July	Cactus Show

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.